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1

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3

9

1



MASTER INDEX TO VOLUMES 151-160

- Aaviksoo, J., see J. Subbi 159 (1989) 292
- Abdel-Raouf, M.A. and J. Ladik, Green's matrix calculations of the interface states of alternating trans polyacetylene-polytetrafluoroethylene and polyethylene-polytetrafluoroethylene chains 156 (1989) 296
- Achkar, Y., see B. Bussery 154 (1989) 280
- Acker, W.P., D.H. Leach and R.K. Chang, Stokes and anti-Stokes hyper-Raman scattering from benzene, deuterated benzene, and carbon tetrachloride 155 (1989) 491
- Adachi, Y., see N. Ami 153 (1988) 118
- Adachi, Y., see S. Matsunuma 154 (1989) 555
- Adamowicz, L., Determination of the relative stability of fluorocytosine tautomers with single and double excitation coupled-cluster (CCSD) method 153 (1988) 147
- Adamowicz, L., Comment on "Determination of the relative stability of fluorocytosine tautomers with a single and double excitation coupled-cluster (CCSD) method" 156 (1989) 628
- Adamowicz, L. and C.I. Frum, Electronic structure of polyatomic systems determined with first-order correlation orbitals. Coupled cluster calculations on lithium cyanide 157 (1989) 496
- Adick, H.-J., see A. Völcker 159 (1989) 103
- Adler, J., see A. Hauser 152 (1988) 468
- Adrian, F.J., K. Akiyama, K.U. Ingold and J.K.S. Wan, The effects of hyperfine interaction and radical concentration on the relative contributions of ST<sub>0</sub> and ST<sub>-</sub> mixing in CIDEP 155 (1989) 333
- Aduru, S., see F. Masson 152 (1988) 325
- Ågren, H., see V. Carravetta 152 (1988) 190
- Ågren, H., C. Medina-Llanos, K.V. Mikkelsen and H.J.Aa. Jensen, On the validity of the equivalent core approximation in Born-Haber analyses of liquids and solutions 153 (1988) 322
- Ahlich, R., M. Häser, H. Schnöckel and M. Tacke, Aluminum  $\eta^2$ -olefin bonds in dimeric 1,4-dichloro-1,4-dialumina-2,5-cyclohexadiene 154 (1989) 104
- Ahlich, R., see D.J. Swanton 155 (1989) 329
- Ahlich, R., see J.P. Limtrakul 160 (1989) 479
- Ahmed, I.M., A. Hudson and A. Alberti, ESR studies of free radicals derived from hydroxyquinones: naphthazarin revisited - twenty-five years of the alternating linewidth effect 151 (1988) 205
- Ahmed, I.M., A. Hudson and A. Alberti, ESR studies of free radicals derived from hydroxyquinones: naphthazarin revisited - twenty-five years of the alternating linewidth effect, Chem. Phys. Letters 151 (1988) 205. Erratum 153 (1988) 583
- Ahmed, M. and A.B. Callear, Rate coefficients for reaction of C<sub>2</sub>H<sub>2</sub>( $\tilde{a}^3B_2$ ) 156 (1989) 35
- Ahmed, M. and A.B. Callear, Mercury photosensitised excitation of SO<sub>2</sub>. Formation of triplet states in termolecular collisions 157 (1989) 556
- Ahmed, M.S., H.Y. So and R.C. Dunbar, Infrared radiative relaxation of benzene ion. ICR photodissociation study of the deuterium isotope effect 151 (1988) 128
- Ajito, K., M. Takahashi and M. Ito, Vibrational frequency shift induced by protonation on pyridine studied by ab initio molecular orbital calculation 158 (1989) 193
- Akama, Y., see S. Yamauchi 151 (1988) 315

- Akamatsu, N., see S. Matsunuma 154 (1989) 555
- Akasheh, T.S. and Z.M. El-Ahmed, Luminescence and redox properties of a series of rhenium-diimine complexes 152 (1988) 414
- Akiyama, K., see F.J. Adrian 155 (1989) 333
- Akiyama, Y., K. Tanaka and T. Tanaka, Infrared diode laser spectroscopy of the  $\text{SiF}^+$  ion 155 (1989) 15
- Alamichel, C., see J. Vergès 159 (1989) 315
- Albaladejo, J., A. Molina and D. Ruiz-Hernandez, Exponential current chronopotentiometry at the dropping mercury electrode. Study of the transition times 152 (1988) 519
- Albert, I.D.L., see S. Ramasesha 154 (1989) 501
- Alberti, A., see I.M. Ahmed 151 (1988) 205; 153 (1988) 583
- Albertoni, C.R., A.W. Castleman Jr. and E.E. Ferguson, Consideration of rotational tunneling in rare gas cluster ions 157 (1989) 159
- Alcaraz, C., J.M. Mestdagh, P. Meynadier, P. de Pujo, J.P. Visticot, A. Binet and J. Cuvellier, The luminescent channels of the reactions of  $\text{Ba}(^1\text{P}_1)$  and  $\text{Ba}(^1\text{D}_2)$  with water 156 (1989) 191
- Aleman, P. and E. Vilaseca, A Monte Carlo study of the benzene effect on the dipole moment of 1,2-dichloroethane 156 (1989) 525
- Alexiou, S., see J.C. Baird 152 (1988) 124
- Al-Hassan, K.A. and T. Azumi, The red edge effect as a tool for investigating the origin of the anomalous fluorescence band of 9,9'-bianthryl in rigid polar polymer matrices, *Chem. Phys. Letters* 150 (1988) 344. Erratum 153 (1988) 583
- Alimi, R., see R.B. Gerber 158 (1989) 257
- Allaf, A.W., G.Y. Matti, R.J. Suffolk and J.D. Watts, The production and photoelectron spectrum of thiazyl iodide. *NSI* 155 (1989) 32
- Almeida, R., see V. Engel 152 (1988) 1
- Almlöf, J., see S. Sæbø 154 (1989) 83
- Alonso, J.L., see R.M. Villamañán 159 (1989) 97
- Altenbach, H.-J., see K.M.T. Yamada 160 (1989) 113
- Altendorf, E. and W.-K. Liu, Laser excitation and desorption of adatoms 153 (1988) 176
- Amano, T., see N. Moazzen-Ahmadi 157 (1989) 1
- Amar, F.G., see J.C. Shelley 152 (1988) 14
- Ambroz, H.B., T.J. Kemp, N.M. Pinhal, G.K. Przybytniak and J.B. Raynor, A powder ENDOR study of a  $\sigma, \pi$ -triplet aryl cation  $^3\text{Ar}^+$  160 (1989) 396
- Amezian, K. and M.C. Bacchus-Montabonel, Ab initio potential energy curves for several molecular states of the multiply charged ion  $(\text{OHe})^{6+}$  155 (1989) 199
- Ami, N., A. Wada, Y. Adachi and C. Hirose, Term values of even parity  $np'$  ( $n=10-16$ ) states of neon determined by two-step optogalvanic spectroscopy 153 (1988) 118
- Amouyal, E., see J.-P. Launay 160 (1989) 89
- Amrein, A., D. Luckhaus, F. Merkt and M. Quack, High-resolution FTIR spectroscopy of  $\text{CHClF}_2$  in a supersonic free jet expansion 152 (1988) 275
- Amrein, A., see H. Bürger 156 (1989) 557
- Amrhein, E.M., see J.A. Centeno 154 (1989) 97
- Anastasi, C., see P. Pagsberg 157 (1989) 271
- Anderson, J., J. Ullo and S. Yip, Molecular dynamics simulation of the concentration-dependent dielectric constants of aqueous NaCl solutions 152 (1988) 447
- Anderson, J.B., see V. Mohan 156 (1989) 520
- Anderson, R.J.M., see J.C. Hamilton 151 (1988) 455

- Anderson, S.M., J. Morton and K. Mauersberger, Laboratory measurements of ozone isotopomers by tunable diode laser absorption spectroscopy 156 (1989) 175
- Anderson, S.M. and K.E. McCurdy, New measurements of  $^{13}\text{C}$  isotopic line shifts for the 0-0 band of the  $\text{CH}(\text{A} \leftarrow \text{X})$  system 157 (1989) 531
- André, J., see G. Brincourt 156 (1989) 573
- Andrés, J.L., A. Lledós, M. Duran and J. Bertrán, Electric fields acting as catalysts in chemical reactions. An ab initio study of the Walden inversion reaction 153 (1988) 82
- Andrew, E.R., see R. Gaspar Jr. 156 (1989) 619
- Andrews, B.K., see J.E. Stout 151 (1988) 156
- Andrews, L., R.B. Bohn, R.T. Arlinghaus and R.D. Hunt, Matrix infrared spectra of HF complexes with  $\text{N}_2\text{O}$ ,  $\text{OCS}$  and  $\text{CS}_2$  158 (1989) 564
- Andrews, L., see J. Hacaloglu 160 (1989) 274
- Angel, G., R. Gagel and A. Laubereau, Femtosecond relaxation dynamics in the electronic ground state of dye molecules studied by polarization-dependent amplification spectroscopy 156 (1989) 169
- Angeloni, L. and R. Righini, Anomalous temperature dependence of the vibrational exciton lifetime in  $\text{NaNO}_3$  crystal 154 (1989) 115
- Angeloni, L., R. Righini, P.R. Salvi and V. Schettino, Relaxation dynamics of Fermi doublets in  $\text{CS}_2$  154 (1989) 432
- Angerhofer, A., J.U. von Schütz and H.C. Wolf, Fluorescence-detected magnetic resonance of bacteriochlorophyll in organic solution 151 (1988) 195
- Aoyagi, M., see M. Ata 157 (1989) 19
- Apkarian, V.A., see N. Schwentner 154 (1989) 237, 413
- Apkarian, V.A., see R.B. Gerber 158 (1989) 257
- Aquilanti, V. and F. Vecchiocattivi, Transport properties of open-shell systems: fine structure effects on collision integrals for oxygen and fluorine atoms with rare gases 156 (1989) 109
- Aquilanti, V., A. Laganà and R.D. Levine, On the all channels representation of the potential energy surface for reactive collisions 158 (1989) 87
- Arai, S., K. Sugita, P. Ma, Y. Ishikawa, H. Kaetsu and S. Isomura, Two-stage IRMPD process for practical  $^{13}\text{C}$  enrichment.  $\text{CHClF}_2/\text{Br}_2$  mixtures 151 (1988) 516
- Arai, S., see A. Takematsu 159 (1989) 282
- Arai, T., H. Okamoto, H. Sakuragi and K. Tokumaru, Mechanism for photoisomerization of 1-styrylpyrene. Finding of a novel type of triplet energy surface with two decay funnels 157 (1989) 46
- Arai, T., T. Karatsu, H. Sakuragi, K. Tokumaru, N. Tamai and I. Yamazaki, Highly selective rotational isomerization of 2-vinylnanthracene in the excited singlet state. Picosecond time-resolved fluorescence study 158 (1989) 429
- Arbour, C. and G.H. Atkinson, Picosecond photodissociation of dibenzyl ketone 159 (1989) 520
- Arepalli, S., see R. Callaghan 158 (1989) 531
- Arikawa, T., see Y. Matsumi 155 (1989) 486
- Arishima, K., see T. Shimada 158 (1989) 435
- Arlinghaus, R.T., see L. Andrews 158 (1989) 564
- Armony, J.L. and E.W. Thulstrup, A low-cost method for the determination of vibrational transition moment directions 158 (1989) 107
- Arnold, J., see V.I. Fabelinsky 156 (1989) 159
- Arrighini, G.P., C. Guidotti and N. Durante, A statistical quasi-classical approach to photoionization 159 (1989) 56
- Arvia, A.J., see S.A. Bilmes 159 (1989) 89

- Ash, D.H., see D.K. Paul 160 (1989) 559
- Astashkin, A.V., S.A. Dikanov and Yu.D. Tsvetkov, The structure of the primary electron donors P865 and P700 of bacterial and plant photosynthesis based on magnetic resonance data 152 (1988) 258
- Ata, M., Y. Suzuki, Y. Kubozono, M. Aoyagi and Y. Gondo, Determination of the deuterium and alkyl-substituent hyperfine coupling constants in nitrobenzene radical anions by formation of cyclodextrin inclusion complexes 157 (1989) 19
- Atakan, B., A. Jacobs, M. Wahl, R. Weller and J. Wolfrum, Kinetic studies of the gas-phase reactions of CN with O<sub>2</sub> and H<sub>2</sub> from 294 to 1000 K 154 (1989) 449
- Atakan, B., A. Jacobs, M. Wahl, R. Weller and J. Wolfrum, Kinetic measurements and product branching ratio for the reaction NH<sub>2</sub> + NO at 294-1027 K 155 (1989) 609
- Atkins, C.G., R.G. Briggs, J.B. Halpern and G. Hancock, Two-photon dissociation of H<sub>2</sub>O at 266 nm 152 (1988) 81
- Atkinson, G.H., see P. Vujkovic Cvijin 159 (1989) 331
- Atkinson, G.H., see C. Arbour 159 (1989) 520
- Atkinson, P.J., M.J. Grimson, R.K. Heenan, A.M. Howe, A.R. Mackie and B.H. Robinson, Microemulsion-based gels: a small-angle neutron scattering study 151 (1988) 494
- Aubert-Frécon, M., see B. Bussery 154 (1989) 280
- Augspurger, J.D. and C.E. Dykstra, Weak, long-range complexes of Mg with HF and H<sub>2</sub> 158 (1989) 399
- Ault, B.S., Excimer-laser-induced oxidation of diborane: formation and isolation of HBO, HB<sup>18</sup>O and H<sub>3</sub>B<sub>3</sub>O<sub>3</sub> in argon matrices 157 (1989) 547
- Ausseneegg, F.R., see S. Draxler 159 (1989) 231
- Avdievich, N.I., E.G. Bagryanskaya, Yu.A. Grishin and R.Z. Sagdeev, Time-resolved stimulated nuclear polarization 155 (1989) 141
- Awaga, K. and Y. Maruyama, Ferromagnetic intermolecular interaction of the organic radical, 2-(4-nitrophenyl)-4,4,5,5-tetramethyl-4,5-dihydro-1H-imidazolyl-1-oxy 3-oxide 158 (1989) 556
- Azria, R., L. Sanche and L. Parenteau, O<sup>-</sup> electron stimulated desorption from O<sub>2</sub> in CO and N<sub>2</sub> matrices 156 (1989) 606
- Azumi, T., see M. Terazima 153 (1988) 27; 160 (1989) 319
- Azumi, T., see K.A. Al-Hassan 153 (1988) 583

- Baba, H., see N. Ikeda 154 (1989) 207
- Bacalis, N.C., see C.A. Nicolaides 151 (1988) 22
- Bacchus-Montabonel, M.C., see K. Amejian 155 (1989) 199
- Bačić, Z., see J.D. Kress 157 (1989) 484
- Back, M.H., see L. Giroux 154 (1989) 610
- Back, R.A., see L. Giroux 154 (1989) 610
- Bacskay, G.B., A quantum chemical study of the HBr and HCN...HBr molecules: the effects of hydrogen bonding on molecular properties 157 (1989) 115
- Bader, J.S. and D. Chandler, Computer simulation of photochemically induced electron transfer 157 (1989) 501
- Bae, Y.K., P.C. Cosby and D.C. Lorents, Observation of shell structures in the growth of microcluster ions 159 (1989) 214
- Baer, M., E. Garcia, A. Laganà and O. Gervasi, An approximate three-dimensional quantum-mechanical study of the  $\text{Li} + \text{HF} \rightarrow \text{LiF} + \text{H}$  reaction 158 (1989) 362
- Bagchi, B., see A. Chandra 151 (1988) 47
- Bagchi, B. and A. Chandra, Solvation of an ion and of a dipole in a dipolar liquid: how different are the dynamics? 155 (1989) 533
- Baggott, J.E., M.A. Blitz and P.D. Lightfoot, The reaction of gas-phase dimethylsilylene with dimethyl ether 154 (1989) 330
- Bagryanskaya, E.G., see N.I. Avdievich 155 (1989) 141
- Bahnmaier, A.H., R.-D. Urban and H. Jones, The infrared spectrum of two isotopic species of indium hydride ( $^{115}\text{InH}$  and  $^{113}\text{InH}$ ) 155 (1989) 269
- Bahnmaier, A.H., see R.-D. Urban 158 (1989) 443
- Bai, Y.S., see K.A. Littau 159 (1989) 1
- Bai, Y.Y. and G.A. Segal, Calculated potential energy surfaces for the electronic states of NCNO that dissociate to the products  $\text{CN}(\tilde{X}^2\Sigma^+) + \text{NO}(\tilde{X}^2\Pi)$  151 (1988) 31
- Baird, J.C. and S. Alexiou, Stark broadening in high angular momentum states of atomic oxygen: application to transitions between 5.5 to 8.0  $\mu\text{m}$  152 (1988) 124
- Baker, G.L., see G.J. Blanchard 158 (1989) 329
- Baker, J., Möller-Plesset perturbation theory with the AUHF wavefunction 152 (1988) 227
- Baker, J., On the stability of the vinylidene radical cation 159 (1989) 447
- Balakrishnan, A., W.J. Jones, C.G. Mahajan and B.P. Stoicheff, Vibronic spectrum of XeKr and determination of ground and excited state dissociation energies 155 (1989) 43
- Balasubramanian, K. and J.Z. Wang, Spectroscopic properties and potential energy curves of thirty-six electronic states of ZrH 154 (1989) 525
- Balasubramanian, K. and P. Feng, The ionization potentials of  $\text{Ag}_n$  and  $\text{Au}_n$  and binding energies of  $\text{Ag}_n^+$ ,  $\text{Au}_n^+$ ,  $\text{Au}_n^{2+}$  and  $\text{Ag}_n^{2+}$  ( $n=1-4$ ) 159 (1989) 452
- Baldrige, K.K., see M.S. Gordon 158 (1989) 189
- Ballard, R.E., J. Jones, D. Read, A. Inchley and M. Cranmer, Auger studies of liquid surfaces and the vapours above them 151 (1988) 477
- Ballhausen, C.J., Step-up and step-down operators for the pseudo-harmonic potential  $V = \frac{1}{2}r^2 + B/2r^2$  in one and two dimensions 151 (1988) 428
- Ballhausen, C.J., A note on the  $V = A/x^2 + Bx^2$  potential, Chem. Phys. Letters 146 (1988) 449. Erratum 154 (1989) 174
- Baltayan, P., F. Hartmann, I. Hikmet, J.-C. Pebay-Peyroula and N. Sadeghi,  $\text{Cu}^+$  ion core conservation from reactant to product in the  $\text{Cu} + \text{F}_2$  chemiluminescent reaction 160 (1989) 549
- Band, Y.B., R. Bavli and D.F. Heller, Multiphoton transitions in molecules with permanent dipole moments 156 (1989) 405

- Banjavcic, M.P., B.H. Watt, T.D. Pope, T.A. Daniels, R.P. Hammond and K.T. Leung, Valence-shell ionization spectra of cyclopropane by symmetric noncoplanar ( $\sigma$ ,  $2\sigma$ ) spectroscopy 160 (1989) 371
- Bao, Y., see R.S. Urdahl 152 (1988) 485
- Bär, M., see J.P. Limtrakul 160 (1989) 479
- Baravian, G., J. Jolly, P. Persuy and G. Sultan, Resonant four-photon ionization of H atoms at 364.7 nm 159 (1989) 361
- Barbara, P.F., see S.R. Flom 154 (1989) 193
- Barclay, V.J., see I.D. Petsalakis 160 (1989) 189
- Bard, A.J., see E.S. Smotkin 152 (1988) 265
- Barker, J.R., see B.M. Toselli 159 (1989) 499
- Barnes, L.A., see C.W. Bauschlicher Jr. 151 (1988) 391
- Barnett, R.N., see J. Jortner 152 (1988) 353
- Baronavski, A.P., see L. Pasternack 154 (1989) 121
- Barrientos, A., see J.A. Centeno 154 (1989) 97
- Barrientos, C., see A. Largo-Cabrero 155 (1989) 550
- Barron, L.D., L. Hecht and P.L. Polavarapu, Polarized Raman optical activity in methyl antisymmetric deformations: influence of heteroatom Rydberg orbitals 154 (1989) 251
- Barron, L.D., see P.K. Bose 155 (1989) 423
- Barron, L.D., see L. Hecht 158 (1989) 341
- Bartels, D.M., A.D. Trifunac and R.G. Lawler, Observations of Heisenberg spin exchange between reactive free radicals 152 (1988) 109
- Bartels, D.M., see P. Han 159 (1989) 538
- Barth, S., see C. Jäger 154 (1989) 45
- Bartlett, R.J., see S. Zarrabian 153 (1988) 133
- Bartlett, R.J., see C. Sosa 153 (1988) 139; 159 (1989) 148
- Bartlett, R.J., see G.W. Trucks 153 (1988) 490
- Bartlett, R.J., S.A. Kucharski and J. Noga, Alternative coupled-cluster ansätze II. The unitary coupled-cluster method 155 (1989) 133
- Bartlett, R.J., see J.D. Watts 157 (1989) 359
- Bartlett, R.J., see M.S. Gordon 158 (1989) 189
- Bartlett, R.J., see S.A. Kucharski 158 (1989) 550
- Bartlett, R.J., see S. Pal 160 (1989) 212
- Basch, H., The electronic structure of  $X_3$ ,  $X=O$ , Se and Te and their anions 157 (1989) 129
- Baskin, J.S., see D.S. Tinti 155 (1989) 243
- Baskin, J.S., see M. Dantus 159 (1989) 406
- Bassi, D., see M. Scotoni 155 (1989) 233
- Bassi, D., see A. Boschetti 158 (1989) 1
- Basterrechea, F.J., see E. Martínez 156 (1989) 564
- Baudon, J., see P. Feron 160 (1989) 555
- Bauer, W., B. Engelhardt, P. Wiesen and K.H. Becker, Lifetime measurements of GeH and CH in the  $A^2\Delta$ ,  $v'=0$  state by laser-induced fluorescence 158 (1989) 321
- Bäuerle, P., see K. Ulrich 155 (1989) 437
- Baumgärtel, H., see E. Rühl 157 (1989) 379
- Bauschlicher Jr., C.W., L.A. Barnes and S.R. Langhoff, On the interpretation of the photoelectron spectrum of  $NiCO^-$  151 (1988) 391
- Bauschlicher Jr., C.W., On the electron affinity of Au, 156 (1989) 91



- Bauschlicher Jr., C.W., On the bonding in  $Mn_2^+$  156 (1989) 95
- Bauschlicher Jr., C.W., S.R. Langhoff and P.R. Taylor, On the electron affinities of the Ca, Sc, Ti and Y atoms 158 (1989) 245
- Bauschlicher Jr., C.W. and S.R. Langhoff, Theoretical study of  $NiAr^+$  158 (1989) 409
- Bauschlicher Jr., C.W., see M. Rosi 159 (1989) 479
- Bauschlicher Jr., C.W. and M. Rosi, On the bonding in  $Be_2^+$  159 (1989) 485
- Bauschlicher Jr., C.W., H. Partridge and D. Ceperley, The dissociation energy of  $He_2^+$  160 (1989) 183
- Bavli, R., see Y.B. Band 156 (1989) 405
- Bayes, K.D., Evidence that  $CH(a^4\Sigma)$  is the precursor of chemi-ionization in hydrocarbon oxidations 152 (1988) 424
- Bayes, K.D., see K.H. Becker 154 (1989) 342
- Bayrakçeken, F. and L. Sağat, Extinction coefficients for the  $\alpha$ -chlorobenzyl and anilino radicals in the vapor phase 159 (1989) 109
- Beach, D.B., see S.M. Gates 154 (1989) 505
- Beaman, R., see R. Sobczynski 154 (1989) 349
- Beattie, C.A., see F.A. Senese 160 (1989) 423
- Beaudet, R.A., see S.W. Sharpe 151 (1988) 267
- Beck, D.D., T.W. Capehart and R.W. Hoffman, Determination of Ce valence in Rh-Ce/ $Al_2O_3$  catalysts by X-ray absorption 159 (1989) 207
- Beck, R. and J.W. Nibler, High resolution Raman loss spectra of solid  $\alpha$ -nitrogen and of matrix-isolated molecules 159 (1989) 79
- Becker, A.C. and U. Schurath, Matrix-isolated NCl. Radiative rates for  $b^1\Sigma^+ \rightarrow a^1\Delta$ ,  $b^1\Sigma^+ \rightarrow X^3\Sigma^-$ , and  $a^1\Delta \rightarrow X^3\Sigma^-$  in solid argon 160 (1989) 586
- Becker, K.H., B. Engelhardt, P. Wiesen and K.D. Bayes, Rate constants for  $CH(X^2\Pi)$  reactions at low total pressures 154 (1989) 342
- Becker, K.H., see W. Bauer 158 (1989) 321
- Becker, P.C., see H.L. Fragnito 160 (1989) 101
- Begemann, M.H., R.W. Dreyfus and J.M. Jasinski, Absolute rate constants for the reaction of SiH with hydrogen, deuterium and silane 155 (1989) 351
- Begemann, M.H., see J.O. Chu 155 (1989) 576
- BelBruno, J.J., The mechanism of iron atom production in the multiphoton dissociation of organometallic iron complexes 160 (1989) 267
- Belov, P.G. and A.D. Milov, Double-modulation ESR and electron spin echo study of paramagnetic centres in fused quartz: comparison of techniques 151 (1988) 79
- Benbouazza, A., see G. Buntinx 153 (1988) 279
- Ben Brahim, M., see C. Cazeau-Dubroca 157 (1989) 393
- Bencini, A. and D. Gatteschi,  $X\alpha$ -SW calculations of the electronic structure and magnetic properties of exchange-coupled transition-metal clusters. Cu(II) dimers as models for  $CuO_2$  layers in high- $T_c$  superconductors 156 (1989) 341
- Bender, D., see K. McMillan 152 (1988) 87
- Ben-Horin, N., see U. Even 156 (1989) 138
- Benito, R.M. and J. Santamaría, Contributions of parent molecule fixed and excess energies to product energy partitioning in four-center elimination reactions 155 (1989) 391
- Bennett, R.R., see I. Wallace 153 (1988) 127
- Benson, M., G. Zhao and T. Gäumann, A method to generate phase continuity in two-dimensional Fourier transform ion cyclotron resonance mass spectrometry 157 (1989) 97
- Berezhkovskii, A.M. and V.Yu. Zitserman, Anomalous regime for decay of the metastable state: an extension of multidimensional Kramers theory 158 (1989) 369

- Berg, L.-E., P. Royen and P. Weijnitz, Lifetime measurements by optical single and double resonances. Radiative lifetimes of the  $A^2\Pi$  and  $D^2\Sigma^+$  states of CaCl 159 (1989) 175
- Bergström, H., H. Hallstadius, H. Lundberg and A. Persson, Detection of carbon using amplified laser-induced fluorescence 155 (1989) 27
- Berkowitz, M., see M. Rami Reddy 155 (1989) 173
- Berlin, Yu.A., see A. Plonka 153 (1988) 433; 158 (1989) 380
- Berman, A., see A. Regev 160 (1989) 401
- Berman, M.R., Production and quenching of  $XeCl(B,C)$  and  $Xe_2Cl^*$  initiated by two-photon excitation of Xe and  $Xe_2$  157 (1989) 562
- Bernard, J., see M. Orrit 156 (1989) 233
- Bernardi, F., F. Grandinetti, A. Guarino and M.A. Robb, Electronic structure of phenyl cation by MC SCF ab initio calculations 153 (1988) 309
- Bernholdt, D.E., see M.S. Gordon 158 (1989) 189
- Berrondo, M., see J. Récamier 158 (1989) 116
- Berry, M.T., M.R. Brustein and M.I. Lester, Experimental determination of the OH-Ar stretching potential 153 (1988) 17
- Berthier, G., see L. Salem 160 (1989) 67
- Bertrán, J., see J.L. Andrés 153 (1988) 82
- Bertrán, J., see E. Bosch 160 (1989) 543
- Bevan, J.W., see K. McMillan 152 (1988) 87
- Bevan, J.W., see B.A. Wofford 152 (1988) 299
- Bevilacqua, T.J., see J.E. Stout 151 (1988) 156
- Bewick, C.P. and B.J. Orr, Fast mode-to-mode vibrational energy transfer in  $D_2CO$  vapour: analysis of a complex pressure dependence 159 (1989) 66
- Bewick, C.P. and B.J. Orr, Rovibrational energy transfer in  $D_2CO$ : evidence of an intramolecular mechanism from studies of  $D_2CO/N_2O$  collisions 159 (1989) 73
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- Bhamre, V., see D.G. Kanhere 160 (1989) 526
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- Bhaskar, N.D., R.P. Frueholz, C.M. Klimcak and R.A. Cook, Production of mass-selected neutral clusters of rubidium 154 (1989) 175
- Bhattacharyya, K., see A. Nag 151 (1988) 474; 157 (1989) 83; 160 (1989) 257
- Bhattacharyya, K., see B. Sarkar 153 (1988) 583
- Bhattacharyya, K., On the temperature dependence of the partition function: molecular free internal rotation 159 (1989) 40
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- Bianconi, A., see M.V. Russo 155 (1989) 599
- Bickelhaupt, F., see O. Grabandt 155 (1989) 221
- Bickelhaupt, F., see F. Stroh 160 (1989) 105
- Bielecki, A., A.C. Kolbert and M.H. Levitt, Frequency-switched pulse sequences: homonuclear decoupling and dilute spin NMR in solids 155 (1989) 341
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Bigot, J.-Y., see H.L. Fragnito	160 (1989) 101
Bilkis, I.I., see V.V. Kononov	157 (1989) 257
Billing, G.D. and G. Jolicard, On the application of the adiabatic invariance method for the identification of "quantum chaos"	155 (1989) 521
Billing, G.D., see M. Cacciatore	157 (1989) 305
Bilmes, S.A., J.C. Rubim, A. Otto and A.J. Arvia, SERS from pyridine adsorbed on electrodeposited platinum electrodes	159 (1989) 89
Binet, A., see C. Alcaraz	156 (1989) 191
Bin Hussein, M.Z., see J.M. Hollas	154 (1989) 14, 228
Bini, R., P. Foggi, N.Q. Liem and P.R. Salvi, Lower excited electronic states of sulfur ( $S_8$ ): a two-photon study by the thermal lensing method	151 (1988) 236
Binning Jr., R.C., see Y. Ishikawa	160 (1989) 206
Birk, H., see U. Magg	151 (1988) 263, 503
Bishop, D.M., General dispersion formulae for atomic third-order non-linear optical properties	153 (1988) 441
Bitto, H., see H.-P. Lutz	155 (1989) 251
Bixon, M., see M.E. Michel-Beyerle	151 (1988) 188
Bixon, M. and J. Jortner, Activationless and pseudoactivationless primary electron transfer in photosynthetic bacterial reaction centers	159 (1989) 17
Blackbourn, R.L. and J.T. Hupp, Optical electron transfer processes. The dependence of intervalence line shape and transition energy on chromophore concentration, <i>Chem. Phys. Letters</i> 150 (1988) 399. Erratum	152 (1988) 528
Blair, J.T., J.D. Westbrook, R.M. Levy and K. Krogh-Jespersen, Simple models for solvation effects on electronic transition energies: formaldehyde and water	154 (1989) 531
Blake, R.S., K.-D. Rinnen, D.A.V. Kliner and R.N. Zare, The $H+D_2$ reaction: $HD(v=1, J)$ and $HD(v=2, J)$ distributions at a collision energy of 1.3 eV	153 (1988) 365
Blake, R.S., see K.-D. Rinnen	153 (1988) 371
Blakley, R.L., see M.L. Myrick	157 (1989) 73
Blakley, R.L., Y. Yin, C. Lloyd, J.T. Mague and G.L. McPherson, Photophysics of a flexible ligand bridged rhodium(I) dimer: an excited state conformational change in a crystalline solid	157 (1989) 398
Blanchard, G.J., J.P. Heritage, G.L. Baker and S. Etemad, The picosecond spectroscopy of a polydiacetylene in the small signal limit: detection and characterization of a new long-lived state	158 (1989) 329
Blankespoor, S.C., see R.D. van Zee	158 (1989) 306
Blasse, G., G.J. Dirksen, A. Meijerink, J.F. van der Pol, E. Neeleman and W. Drenth, Luminescence and energy migration in the solid state and in the ordered columnar mesophase of peripherally octa- <i>n</i> -dodecoxy-substituted phthalocyanine	154 (1989) 420
Blasse, G., J. Sytsma and L.H. Brixner, X-ray excited $Gd^{3+}$ emission in the $PbFCl$ structure: higher-level emission and vibronics	155 (1989) 64
Blasse, G., see L.H. Brixner	157 (1989) 283
Blasse, G., L.H. Brixner and N. Sabbatini, X-ray-excited luminescence of samarium(III), europium(III), gadolinium(III) and terbium(III) 2.2.1. cryptates	158 (1989) 504
Blasse, G., see H. Donker	158 (1989) 509
Blitz, M.A., see J.E. Baggott	154 (1989) 330
Bloomfield, L.A., see Y.A. Yang	158 (1989) 279
Bloor, D., see A.J. Brown	151 (1988) 247

- Bloor, J.E., see D.W. Noid 154 (1989) 391
- Blumen, A., see H. Schnörrer 160 (1989) 80
- Boden, N., R.J. Bushby, J. Clements, M.V. Jesudason, P.F. Knowles and G. Williams, One-dimensional electronic conductivity in discotic liquid crystals 152 (1988) 94
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- Boens, N., see A. Malliaris 155 (1989) 587
- Boesl, U., see K. Walter 155 (1989) 8
- Bofill, J.M., see P. Pulay 156 (1989) 501
- Bogey, M., C. Demuyne and J.L. Destombes, Millimeter wave spectrum of  $\text{MgCl X}^2\Sigma^+$  and isotopomers in different vibrational states. Determination of mass-invariant parameters 155 (1989) 265
- Bohn, R.B., see L. Andrews 158 (1989) 564
- Bohne, C., R. Konuk and J.C. Scaiano, Dynamics of the redistribution of 1-dodecylpyrene aggregates in micellar solution 152 (1988) 156
- Boicelli, C.A., see M. Giomini 158 (1989) 334
- Boillot, M.-L., see J.-P. Launay 160 (1989) 89
- Bokun, V.Ch., see S.A. Sotnichenko 153 (1988) 560
- Bolduc, P.R., see P. Politzer 158 (1989) 463
- Bonazzola, L., J.P. Michaut and J. Roncin, The structure of  $\text{CCl}_4^-$  and  $\text{CH}_2\text{Cl}_2^-$ : an ESR and theoretical study 153 (1988) 52
- Bondybey, V.E., see M.F. Cai 155 (1989) 430; 158 (1989) 475
- Bonomo, R.P., A.J. Di Bilio and F. Riggi, EPR study of copper(II) ions in zinc 1-malate trihydrate 151 (1988) 208
- Bopp, P., see G. Heinje 152 (1988) 358
- Borkovec, M. and H.-F. Eicke, Surfactant monolayer rigidities from Kerr effect measurements on microemulsions 157 (1989) 457
- Bortolus, P., see G. Gennari 157 (1989) 194
- Bosch, E., M. Moreno, J.M. Lluch and J. Bertrán, Intrinsic reaction coordinate calculations for reaction paths possessing branching points 160 (1989) 543
- Boschetti, A., see M. Scotoni 155 (1989) 233
- Boschetti, A., M. Scotoni, L. Quercia and D. Bassi, On Raman-induced photodissociation of neutral van der Waals clusters with visible laser light 158 (1989) 1
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- Boulon, G., see W. Nie 160 (1989) 597

- Boursey, E., see C. Maïnos 154 (1989) 563
- Bower, J.E., see U. Ray 159 (1989) 221
- Bowers, M.T., see J.T. Snodgrass 159 (1989) 10
- Bowman, R.M. and K.B. Eisenthal, The role of translational friction in isomerization reactions 155 (1989) 99
- Bowman, R.M., M. Dantus and A.H. Zewail, Femtochemistry of the reaction:  $\text{IHgI}^* \rightarrow [\text{IHg}\cdots\text{I}]\ddagger \rightarrow \text{HgI} + \text{I}$  156 (1989) 131
- Bowman, R.M., see M. Dantus 159 (1989) 406
- Boyer, J.H., see I.R. Politzer 159 (1989) 258
- Bradford, E.G., see L.S. Prasad 151 (1988) 443
- Bradshaw, A.M., see D. Hoge 151 (1988) 230
- Brauer, H.-D., see A. Völcker 159 (1989) 103
- Brauer, H.-D., see K. Jesse 160 (1989) 8
- Brearley, A.M. and D.B. McDonald, Picosecond fluorescence study of the energy dependence of geminate recombination kinetics in nonpolar liquids 155 (1989) 83
- Breckenridge, W.H., see I. Wallace 153 (1988) 127
- Brédas, J.L. and A.J. Heeger, The role of solitons in the first  $B_u$  excited state of polyene chains: from short polyenes to polyacetylene 154 (1989) 56
- Breidung, J., W. Thiel and A. Komornicki, Analytical second derivatives for effective core potentials 153 (1988) 76
- Brenton, A.G., see M. Hamdan 155 (1989) 321
- Brewer, W.E., S.L. Studer, P.-T. Chou and E. Orton, Temperature-dependent study of the ground-state reverse proton transfer of 3-hydroxyflavone 158 (1989) 345
- Brey Jr., W.S., see R. Gaspar Jr. 156 (1989) 619
- Briggs, R.G., see C.G. Atkins 152 (1988) 81
- Briggs, R.G., J.B. Halpern, G. Hancock, N. Shafizadeh, J. Rostas, J.L. Lemaire and F. Rostas, Photodissociation of  $\text{D}_2\text{O}$  in the second continuum by two-photon absorption at 266 nm 156 (1989) 363
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- Brion, J., see J. Malicet 158 (1989) 293
- Brixner, L.H., see G. Blasse 155 (1989) 64; 158 (1989) 504
- Brixner, L.H. and G. Blasse, X-ray excited  $^6\text{G}$  and lower term emission from the  $\text{Gd}^{3+}$  ion 157 (1989) 283
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- Brooks III, C.L., see D.J. Tobias 156 (1989) 256
- Brown, A.J., G. Rumbles, D. Phillips and D. Bloor, Sidegroup dependence of chromism in polydiacetylenes 151 (1988) 247
- Brown, F.B., see S. Li 151 (1988) 403
- Brown, R.D., P.D. Godfrey, D. McNaughton and A.P. Pierlot, A study of the major gas-phase tautomer of adenine by microwave spectroscopy 156 (1989) 61
- Brown, R.G., see C.A.S. Potter 153 (1988) 7
- Brucat, P.J., see D. Lessen 152 (1988) 473; 160 (1989) 609
- Bruna, P.J., see J.S. Wright 156 (1989) 533

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- Brunvoll, J., see S.J. Cyvin 156 (1989) 595
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- Brusilovsky, D., see R. Reisfeld 153 (1988) 210; 160 (1989) 43
- Brustein, M.R., see M.T. Berry 153 (1988) 17
- Brutschy, B., see E. Rühl 157 (1989) 379
- Bryant, G.W., D.F. Eggers and R.O. Watts, High resolution infrared spectrum of acetylene tetramer 151 (1988) 309
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- Buckner, S.W., see J.R. Gord 153 (1988) 577
- Budenholzer, F.E. and D.C. Jeng, Comment on "A modified LEPS potential energy surface for the F+H<sub>2</sub> reaction" by T. Takayanagi and S. Sato 156 (1989) 411
- Buenker, R.J., see K. Bhanuprakash 152 (1988) 215
- Buhl, J.-Ch., see G. Engelhardt 153 (1988) 332
- Bühlmann, C., A. Schweiger and R.R. Ernst, Hyperfine-selective ENDOR 154 (1989) 285
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- Bulatov, V.P., see A.A. Ioffe 156 (1989) 425
- Bulatov, V.P., A.A. Ioffe, V.A. Lozovsky and O.M. Sarkisov, On the reaction of the NH<sub>2</sub> radical with NO<sub>2</sub> at 295-620 K 159 (1989) 171
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- Bunton, C.A., see B. Focher 158 (1989) 491
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- Burkhart, R.D., see G.W. Haggquist 152 (1988) 56
- Burkhart, R.D., see D.K. Chakraborty 157 (1989) 189
- Burkholder, J.B., see J. Wormhoudt 158 (1989) 480
- Burstein, Z., see R. Reisfeld 160 (1989) 43
- Burton, K.A., see J.T. Miller 158 (1989) 179
- Burton, N.A., I.H. Hillier, M.F. Guest and J. Kendrick, Pseudopotential calculations of the geometry and ionization energies of palladium(II) acetylacetonate 155 (1989) 195
- Bushby, R.J., see N. Boden 152 (1988) 94; 154 (1989) 613
- Busmann, H.-G., see H. Staerk 155 (1989) 603
- Bussery, B., Y. Achkar and M. Aubert-Frécon, Coulomb interaction energy including overlap effects for the ground states of LiNa and Na<sub>2</sub> 154 (1989) 280
- Butz, T., see G. Sun 151 (1988) 54
- Bylina, E.J., see C. Kirmaier 159 (1989) 251

- Cacciatore, M., M. Capitelli and G.D. Billing, Vibration-to-translation energy exchanges in  $H_2$  colliding with highly vibrationally excited  $H_2$  molecules 157 (1989) 305
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- Calabrese, J.C., see W. Tam 154 (1989) 93
- Callaghan, R., Y.-L. Huang, S. Arepalli and R.J. Gordon, Single-photon VUV laser-induced fluorescence spectra of HCl and HBr 158 (1989) 531
- Callear, A.B. and I.A. Cooper, Combination of  $CH_3$  with CHO 155 (1989) 146
- Callear, A.B., see M. Ahmed 156 (1989) 35; 157 (1989) 556
- Calvani, P. and S. Lupi, A determination of librational splittings in solid  $CD_4$ -II from infrared spectra 157 (1989) 11
- Calvert, J.G., see C.A. Cantrell 152 (1988) 274
- Calvo Hernández, A., J.A. White and S. Velasco, Theoretical far-infrared spectrum of HCl in liquid Ar: a density dependence study 160 (1989) 60
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- Campillo, A.J., see B.L. Justus 156 (1989) 64
- Campillo, A.J., see C.D. Merritt 159 (1989) 349
- Campion, A., see E.S. Smotkin 152 (1988) 265
- Campochiaro, C., D.S. McClure, P. Rabinowitz and S. Dougal, Vibronic coupling in the two-photon  $A_2 \rightarrow ^4T_2$  spectrum of  $Mn^{4+}$  in the cubic and trigonal sites of  $Cs_2MF_6$ ,  $M=Si$ ,  $Ge$ ,  $Ti$  157 (1989) 78
- Cannistraro, S., see F. Severcan 153 (1988) 263
- Cantrell, C.A., J.A. Davidson, A.H. McDaniel, R.E. Shetter and J.G. Calvert, Infrared absorption cross sections for  $N_2O_3$ , Chem. Phys. Letters 148 (1988) 358. Erratum 152 (1988) 274
- Cantú, L., see V. Degiorgio 151 (1988) 349
- Canuto, S. and M.C. Zerner, On the inter-ring separation of the lowest excited and ionized states of [2.2]paracyclophane 157 (1989) 353
- Capehart, T.W., see D.D. Beck 159 (1989) 207
- Capitelli, M., see M. Cacciatore 157 (1989) 305
- Capobianco, J.A., P.P. Proulx and N. Raspa, Laser-excited fluorescence spectroscopy and crystal field analysis of europium(III)-doped cordierite glass 160 (1989) 591
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- Carr, R.G., see J.L. Gland 151 (1988) 227
- Carravetta, V., H. Ågren, D. Nordfors and S. Svensson, Static exchange and Stieltjes imaging calculations; interpretation of a new high-resolution Cl 2p shake-up/shake-off spectrum of HCl 152 (1988) 190
- Carravetta, V., see I. Cacelli 155 (1989) 210
- Carrington, A., I.R. McNab and C.A. Montgomerie, Laser excitation and electric field dissociation spectroscopy of the  $HD^+$  ion 151 (1988) 258

- Carrington, A., I.R. McNab and C.A. Montgomerie, Microwave electronic spectrum of the  $H_2^+$  ion 160 (1989) 237
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- Carter, T.P., D.E. Horne and W.E. Moerner, Pseudo-Stark effect and FM/Stark double modulation spectroscopy for the detection of statistical fine structure in alexandrite 151 (1988) 102
- Casarin, M., see F. Leij 160 (1989) 39
- Castellano, E., see A.E. Croce 158 (1989) 157
- Castex, M.C., see C. Mañós 154 (1989) 563
- Castiglioni, C., see M.N. Ramos 151 (1988) 397; 152 (1988) 528
- Castiglioni, C., see M. Gussoni 160 (1989) 200
- Castillejo, M., J.M. Figuera, I. Garcia-Moreno and J. Medina, Quenching of  $CH_2(\bar{b}^1B_1)$  by hydrocarbons 157 (1989) 41
- Castleman Jr., A.W., see C.R. Alvertoni 157 (1989) 159
- Catella, R., see G. Brincourt 156 (1989) 573
- Cazeau, Ph., see C. Cazeau-Dubroca 157 (1989) 393
- Cazeau-Dubroca, C., A. Peirigua, M. Ben Brahim, G. Nouchi and Ph. Cazeau, Specific hydrogen bonding interaction versus the "free volume" model for TICT molecules in polymeric matrices 157 (1989) 393
- Ceccorulli, G., see G. Giro 153 (1988) 583
- Cederbaum, L.S., see E. Ohrendorf 151 (1988) 273
- Centeno, J.A., E.M. Amrhein and A. Barrientos, Use of first-order Raman scattering to characterize  $YBa_2Cu_3O_{7-\delta}$  superconductors: effects of surface changes 154 (1989) 97
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- Černušák, I., see M. Urban 159 (1989) 155
- Chakraborty, D.K. and R.D. Burkhart, Delayed fluorescence and delayed excimer fluorescence from fluid solutions of poly(2-vinylnaphthalene) in the nanosecond time regime 157 (1989) 189
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- Chandler, D.W., J.W. Thoman Jr., M.H.M. Janssen and D.H. Parker, Photofragment imaging: the 266 nm photodissociation of  $CH_3I$  156 (1989) 151
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- Chandra, A., see B. Bagchi 155 (1989) 533
- Chandrasekharan, V., see Y. Garrabos 160 (1989) 250
- Chang, R.K., see W.P. Acker 155 (1989) 491
- Chang, W.-L., see T.C. Steimle 153 (1988) 534
- Chang, Y.J., S. Laneman and J.B. Hopkins, Picosecond Raman studies of solvent-assisted proton transfer to the charge transfer excited state of pentaammine (4,4'-bipyridine) ruthenium(II) 156 (1989) 421
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- Chattopadhyay, N., see A. Nag 157 (1989) 83
- Chaudhuri, R., see D. Sinha 154 (1989) 544
- Chekunaev, N.I., see A. Plonka 158 (1989) 380
- Chen, C.H. and M.P. McCann, Laser-induced pH change in solution 153 (1988) 338
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- Cheong, B.S., see J.M. Parson 152 (1988) 330
- Chermette, H., see M. Morin 159 (1989) 472
- Cheskis, S.G., see V.P. Bulatov 153 (1988) 258
- Cheskis, S.G., A.A. Iogansen, P.V. Kulakov, I.Yu. Razuvaev, O.M. Sarkisov and A.A. Titov, OH vibrational distribution in the reaction  $O(^1D) + CH_4$  155 (1989) 37
- Chesnovsky, O., see K.J. Taylor 152 (1988) 347
- Chesnoy, J., see A. Mokhtari 155 (1989) 593
- Chesnut, D.B., D.W. Wright and R.A. MacPhail, Effects of torsion on the  $^{13}C$  chemical shift in ethane 151 (1988) 415
- Chevillard, J., see J. Vergès 159 (1989) 315
- Chichinin, A.I. and L.N. Krasnoperov,  $Cl(^2P_{1/2})$  relaxation studied by fast magnetic field jump time-resolved laser magnetic resonance 160 (1989) 448
- Child, M.S., see J.T. Muckerman 153 (1988) 477
- Child, M.S., see J.W. Thompson 157 (1989) 343
- Chiu, Y.-N., see L. Chow Chiu 151 (1988) 220
- Cho, H., S. Pfenninger, C. Gemperle, A. Schweiger and R.R. Ernst, Zero deadtime pulsed ESR by remote echo detection 160 (1989) 391
- Choi, Y. and K.D. Jordan, Electron transmission spectra of carbonyl fluoride: determination of the vertical electron affinity 156 (1989) 450
- Chou, P.-T., see W.E. Brewer 158 (1989) 345
- Chow Chiu, L., Y.-N. Chiu, T. Krümpelmann and Ch. Ottinger, Selective population of the fine structure levels of  $N_2(B^3\Pi_{g,\Omega})$  in the excitation transfer between  $Xe(^3P_J)$  and  $N_2(X^1\Sigma_g^+)$  151 (1988) 220
- Chow Chiu, L., T. Krümpelmann and Ch. Ottinger,  $\Omega$ -level selectivity of  $CO(d^3\Delta_\Omega)$  produced by excitation transfer from  $Xe(^3P_{0,2})$  to  $CO(X^1\Sigma^+)$  157 (1989) 60
- Chu, J.O., M.H. Begemann, J.S. McKillop and J.M. Jasinski, Quantum yield studies of disilane photodissociation at 193 nm by infrared diode laser spectroscopy 155 (1989) 576
- Chu, S.-I., see K. Wang 153 (1988) 87
- Chu, S.-I., Z.-C. Wu and E. Layton, Density matrix formulation of complex geometric quantum phases in dissipative systems 157 (1989) 151
- Chuang, T.J., see A. Mödl 154 (1989) 187
- Chu-Ko, B.J., see R.S. Wilson 151 (1988) 431
- Chupka, W.A., see L. Li 151 (1988) 335
- Churakov, V.V., see A.S. Solodukhin 158 (1989) 70
- Ci, X. and A.B. Myers, A resonance Raman study of solvent effects on the excited state potential surface of trans-stilbene 158 (1989) 263
- Ciccotti, G., see E.A. Carter 156 (1989) 472
- Cimiraglia, R., A. Ferretti and N.K. Rahman, Effect of the increase of molecular complexity on statistical properties of vibrational spectra 151 (1988) 38

- Cimiraglia, R., D. Maynau and M. Persico, Contracted and supercontracted basis sets in the theoretical treatment of coordination compounds: the cyclopentadienyl anion and ferrocene 153 (1988) 507
- Cioslowski, J., On extracting the bulk properties from results of small cluster calculations 153 (1988) 446
- Clark, D.L., J.C. Green, C.M. Redfern, G.E. Quelch, I.H. Hillier and M.F. Guest, An experimental and theoretical study of the ionization energies of  $\text{Ru}_2(\text{O}_2\text{CCF}_3)_4$  and  $\text{Ru}_2(\text{O}_2\text{CCF}_3)_4(\text{NO})_2$  154 (1989) 326
- Clary, D.C. and C.E. Dateo, Competition between vibrational and rotational excitation in glyoxal 154 (1989) 62
- Clement, S.G., see A.P. Cox 158 (1989) 6
- Clementi, E., see A.K. Mohanty 157 (1989) 348
- Clements, J., see N. Boden 152 (1988) 94; 154 (1989) 613
- Clergeot, B., see T.-H. Tran-Thi 157 (1989) 92
- Clouthier, D.J., see J.R. Dunlop 151 (1988) 362; 154 (1989) 613
- Cobb, S.H., J.R. Woodward and J.L. Gole, Continuous chemical amplification of single- and multi-mode lasers in the visible region 156 (1989) 197
- Cobos, C.J., Statistical adiabatic channel model study of the  $\text{H} + \text{O}_2 \rightarrow \text{HO}_2$  reaction on the Lemon and Hase potential energy surface 152 (1988) 371
- Cobos, C.J., see A.E. Croce 158 (1989) 157
- Codling, K., see P.A. Hatherly 159 (1989) 355
- Cogdell, R.J., see J. Ullrich 155 (1989) 363
- Cogdell, R.J., see T. Gillbro 158 (1989) 312
- Cohen, R.B., see J.E. Pollard 152 (1988) 171
- Cohen, S.R. and R. Naaman, Energy distribution between spin-orbit states in NO scattered from organized amphiphilic monolayers 152 (1988) 269
- Collart, P., see N. Ikeda 154 (1989) 207
- Colson, S.D., see L. Li 151 (1988) 335
- Comes, F.J., see K. Jesse 160 (1989) 8
- Conover, C.W.S., see Y.A. Yang 158 (1989) 279
- Cook, R.A., see N.D. Bhaskar 154 (1989) 175
- Coolbaugh, M.T., W.R. Peifer and J.F. Garvey, Ion-molecule chemistry within doubly charged ammonia clusters 156 (1989) 19
- Cooper, D.L. and K. Kirby, Theoretical study of the  $(3s\sigma)^1\Pi$  Rydberg state of CO 152 (1988) 393
- Cooper, D.L. and K. Kirby, Theoretical study of the  $(3s\sigma)^1\Pi$  Rydberg state of CO, Chem. Phys. Letters 152 (1988) 393. Erratum 155 (1989) 624
- Cooper, I.A., see A.B. Callear 155 (1989) 146
- Cooper, W.F. and W.L. Parker, Luminescent detection of  $\text{Rh}^+$  in supported metal catalysts 156 (1989) 463
- Copeland, R.A., see J.B. Jeffries 152 (1988) 160
- Corey, G.C. and D. Lemoine, Steric effects in gas-surface scattering: a quantum close-coupled study of collisions of oriented NO ( $X^2\Pi$ ) with a Ag(111) surface 160 (1989) 324
- Corti, M., see V. Degiorgio 151 (1988) 349
- Cory, D.G., Separation of non-protonated from protonated carbon NMR resonances in solids by inversion-recovery cross polarization 152 (1988) 431
- Cosby, P.C. and H. Helm, Experimental determination of the  $\text{H}_3^+$  bond dissociation energy 152 (1988) 71
- Cosby, P.C., see Y.K. Bae 159 (1989) 214
- Costa, C., see V. Magnasco 156 (1989) 585; 160 (1989) 469
- Couch, A.D., see A.P. Cox 158 (1989) 6
- Courtney, S.H., see S.K. Kim 159 (1989) 543



Cousins, L.M. and S.R. Leone, Time-of-flight measurements of hyperthermal Cl <sub>2</sub> molecules produced by UV laser vaporization of cryogenic chlorine films	155 (1989) 162
Cox, A.P., J. Randell and A.C. Legon, Nitrogen-14 quadrupole coupling in cyclopentadienyl nickel nitrosyl by microwave spectroscopy	153 (1988) 253
Cox, A.P., A.D. Couch, I.M. Hedgecock and S.G. Clement, Microwave detection, structures and dipole moments of SiF <sub>3</sub> CN and SiF <sub>3</sub> NC	158 (1989) 6
Cox, R.A., see G.D. Hayman	155 (1989) 1
Cox, S.F.J., G.H. Eaton, J.E. Magraw and C.A. Scott, Muon addition to oxygen in ice: characterisation of the diamagnetic product by level crossing resonance	160 (1989) 85
Crago, K.T., see I.R. Politzer	159 (1989) 258
Cranmer, M., see R.E. Ballard	151 (1988) 477
Craycraft, M.J., see K.J. Taylor	152 (1988) 347
Cremer, D., see J. Gauss	153 (1988) 303
Crespin, M., see I. Palchan	157 (1989) 321
Creuzburg, M., F. Koch and F. Wittl, Low-temperature photolysis of hydrocarbons in solid xenon: evidence for metastable Xe <sub>n</sub> H	156 (1989) 387
Cristinziano, P.L., see F. Lelj	160 (1989) 39
Croce, A.E., C.J. Cobos and E. Castellano, Pulsed laser photolysis study of the reaction Cl + FSO <sub>3</sub> + M → FSO <sub>2</sub> OCi + M	158 (1989) 157
Crosley, D.R., see J.B. Jeffries	152 (1988) 160
Crouch, S.R., see Y.-Y.J. Wu	155 (1989) 69
Cuccaro, S.A., P.G. Hipes and A. Kuppermann, Hyper-spherical coordinate reactive scattering using variational surface functions	154 (1989) 155
Cuccaro, S.A., P.G. Hipes and A. Kuppermann, Symmetry analysis of accurate H + H <sub>2</sub> resonances for low partial waves	157 (1989) 440
Cui, Z.F., see X.Z. Zhao	159 (1989) 37
Cunha, M., see T. Fonseca	155 (1989) 385
Cuvellier, J., see C. Alcaraz	156 (1989) 191
Cyvin, B.N., see S.J. Cyvin	156 (1989) 595
Cyvin, S.J., B.N. Cyvin and J. Brunvoll, Kekulé structure counts and multiple coronoid hydrocarbons	156 (1989) 595
Czarnecki, M.A., see J.P. Hawranek	151 (1988) 340

- Dagdigian, P.J., see J.P. Doering 154 (1989) 234
- Daltrozso, E., see R. Hirschmann 151 (1988) 60
- Danielewicz-Ferchmin, I., On the non-linear dielectric effect in some non-polar liquids and nitrobenzene 155 (1989) 539
- Danielewicz-Ferchmin, I., On the non-linear dielectric effect in some non-polar liquids and nitrobenzene, Chem. Phys. Letters 155 (1989) 539. Erratum 158 (1989) 571
- Daniels, T.A., see M.P. Banjavcic 160 (1989) 371
- Dantus, M., see R.M. Bowman 156 (1989) 131
- Dantus, M., R.M. Bowman, J.S. Baskin and A.H. Zewail, Femtosecond real-time alignment in chemical reactions 159 (1989) 406
- Danzeiser, D., see K. McMillan 152 (1988) 87
- Dargelos, A., see M. Papailhou 155 (1989) 406
- Das, B.B., see P. Raghunathan 160 (1989) 627
- Das, R., see N. Periasamy 160 (1989) 457
- Das, S.K., see R. Debnath 155 (1989) 52
- Datar, A., S.D. Prasad and L.K. Doraiswamy, On the identification of the nature of adsorbate interactions 159 (1989) 337
- Dateo, C.E., see D.C. Clary 154 (1989) 62
- Daudey, J.-P., see M. Hliwa 153 (1988) 471
- Daul, C.A., see S.M. Jacobsen 158 (1989) 77
- Daumont, D., see J. Malicet 158 (1989) 293
- Davidson, J.A., see C.A. Cantrell 152 (1988) 274
- Davies, P.B., N.A. Martin, M.D. Nunes, D.A. Pape and D.K. Russell, Infrared laser absorption studies of jet-cooled nickel tetracarbonyl 156 (1989) 553
- Davoli, I., see M.V. Russo 155 (1989) 599
- Davy, R.D., see C. Liang 159 (1989) 393
- Dawes, T.D., see R.A. Goldbeck 156 (1989) 545
- Dayton, D.C. and R.E. Miller, Gas-phase infrared spectroscopy of cyclopropane-HF and cyclopropane-HCN 153 (1988) 285
- Dayton, D.C. and R.E. Miller, Infrared spectroscopy of the HCN-(HF)<sub>2</sub> ternary complex 156 (1989) 578
- DeArmond, M.K., see M.L. Myrick 157 (1989) 73
- Debnath, D., see R.V. Gopala Rao 157 (1989) 180
- Debnath, R. and S.K. Das, Site-dependent luminescence of Cu<sup>+</sup> ions in silica glass 155 (1989) 52
- Decomps, B., see P. Feron 160 (1989) 555
- DeFrees, D.J. and A.D. McLean, A priori predictions of the rotational constants for HC<sub>13</sub>N, HC<sub>15</sub>N, and C<sub>3</sub>O 158 (1989) 540
- Degen, J., see T. Schönherr 158 (1989) 519
- De Giambiagi, M.S., see M. Giambiagi 152 (1988) 222
- Degiorgio, V., M. Corti and L. Cantú, Neutron scattering investigation of isotropic solutions of non-ionic amphiphiles at high concentration 151 (1988) 349
- De Haas, M.P., see K.J. Smit 152 (1988) 177
- De Lange, C.A., see O. Grabandt 155 (1989) 221; 160 (1989) 359
- De Leon, N. and S.P. Neshyba, Total projection probabilities on non-orthogonal states: calculation of electronic populations in molecules 151 (1988) 296
- Delhalle, J., see G. Hennico 152 (1988) 207
- DeLuca, M.J. and M.A. Johnson, Photofragmentation of C<sub>n</sub><sup>-</sup>, 4 ≤ n ≤ 20: loss of neutral C<sub>3</sub> 152 (1988) 67
- Demaison, J., see J. Gadhi 156 (1989) 401

Demekhin, V.F., see B.M. Lagutin	160 (1989) 432
De Merás, A.M.S., see J. Olsen	154 (1989) 380
Demontis, P., see S. Yashonath	153 (1988) 551
Demuynck, C., see M. Bogey	155 (1989) 265
Depasse, F. and J.M. Vigoureux, The use of the stationary perturbation method in calculations of surface-induced dynamic polarizability	160 (1989) 311
DePristo, A.E., K. Haug and H. Metiu, A new method for calculating time-dependent quantum correlation functions for systems with many degrees of freedom	155 (1989) 376
De Pujo, P., see C. Alcaraz	156 (1989) 191
De Santis, A. and A. Gregori, Quantum corrections to induced light scattering and the second virial coefficient of water and hydrogen sulfide	160 (1989) 55
De Schryver, F.C., see N. Ikeda	154 (1989) 207
De Schryver, F.C., see A. Malliaris	155 (1989) 587
Deshpande, A.V. and N.B. Iyer, Solvent effect and viscosity effect on laser spectra of Eosin Y	157 (1989) 239
Destombes, J.L., see M. Bogey	155 (1989) 265
Dewey, T.G., Quantum field theory of polyelectrolyte counterion condensation	151 (1988) 16
De Xammar Oro, J.R., see J.R. Grigera	156 (1989) 615
Di Bilio, A.J., see R.P. Bonomo	151 (1988) 208
Dick, B., On the barrier to excited-state intramolecular proton transfer (ESIPT): The controversial assignment of the spectra of 2,5-bis(2-benzoxazolyl)hydroquinone in solid argon	158 (1989) 37
Diehl, P., H.R. Wasser, G.A. Nagana Gowda, N. Suryaprakash and C.L. Khetrpal, Metal-ion-ligand interactions in thermotropic liquid crystals	159 (1989) 199
Diehl, P., H.R. Wasser, G.A. Nagana Gowda, N. Suryaprakash and C.L. Khetrpal, An NMR study of the coexistence of nematic and "induced" smectic phases in mixtures of nematics	159 (1989) 318
Diercksen, G.H.F., see V. Kellö	152 (1988) 387
Diercksen, G.H.F. and A.J. Sadlej, Electric properties of ionic diatoms: LiF	153 (1988) 93
Diercksen, G.H.F. and A.J. Sadlej, A possible determination of the nuclear quadrupole moment of $^9\text{Be}$ from molecular calculations of electric properties of $\text{BeH}^+$	155 (1989) 127
Diercksen, G.H.F. and A.J. Sadlej, Interaction in halide ion-rare gas systems: the $\text{Cl}^- \dots \text{He}$ interaction potential	156 (1989) 269
Diercksen, G.H.F., see M. Urban	159 (1989) 155
Diguët, R., see C. Millot	160 (1989) 228
Dikanov, S.A., see A.V. Astashkin	152 (1988) 258
Dikanov, S.A., R.G. Evelo, A.J. Hoff and A.M. Tyryshkin, Orientation-dependent ESEEM spectroscopy in disordered systems. Applications to bis(acetylacetonato)oxo-vanadium(IV) adducts in frozen solution and comparison with ENDOR data	154 (1989) 34
Dikanov, S.A., see R.G. Evelo	157 (1989) 25
Dillmann, A. and G.E.A. Meier, Homogeneous nucleation of supersaturated vapors	160 (1989) 71
Di Marco, P.G., see G. Giro	153 (1988) 583
Dimitrijević, N.M., see P.V. Kamat	157 (1989) 384
Di Napoli, V., A. Mele, D. Stranges, A. Giardini-Guidoni and R. Teghil, IR laser photolysis of mixtures of silane with nitric oxide and acetylene	154 (1989) 217
Ding, R.S., see L.S. Prasad	151 (1988) 443

- Dirksen, G.J., see G. Blasse 154 (1989) 420
- Disch, R.L. and J.M. Schulman, Correlation effects in the ab initio thermochemistry of benzene 152 (1988) 402
- Dixon, R.N., J. Nightingale, C.M. Western and X. Yang, Determination of the pair correlation of OH rotational states from the 266 nm photolysis of  $\text{H}_2\text{O}_2$  using velocity-aligned Doppler spectroscopy 151 (1988) 328
- Dodhy, A., W. Ketterle, H.-P. Messmer and H. Walther, A zero kelvin Rydberg spectrum of  $\text{H}_3$  151 (1988) 133
- Doering, J.P. and P.J. Dagdigan, Experimental electron scattering spectrum of atomic carbon 154 (1989) 234
- Doig, S.J., see P.J. Reid 156 (1989) 163
- Domcke, W., see R. Schneider 159 (1989) 61
- Domen, K., see A. Mödl 154 (1989) 187
- Donaldson, D.J., see E.C. Richard 157 (1989) 295
- Donker, H., W. van Schaik, W.M.A. Smit and G. Blasse, On the luminescence of selenium(IV) in  $\text{A}_2\text{ZrCl}_6$  (A=Cs, Rb) 158 (1989) 509
- Donlon, M., see O.J. Nielsen 156 (1989) 312
- Donovan, M.M., see Y. Takai 159 (1989) 376
- Doraiswamy, L.K., see A. Datar 159 (1989) 337
- Dorn, H.C., R. Gitti, K.H. Tsai and T.E. Glass, The flow transfer of a bolus with  $^1\text{H}$  dynamic nuclear polarization from low to high magnetic fields 155 (1989) 227
- Dougal, S., see C. Campochiaro 157 (1989) 78
- Draxler, S., M.E. Lippitsch and F.R. Aussenegg, Long-range excitation energy transfer in Langmuir-Blodgett multilayer systems 159 (1989) 231
- Drenth, W., see G. Blasse 154 (1989) 420
- Dreyfus, R.W., see M.H. Begemann 155 (1989) 351
- Drickamer, H.G., see W.S. Hammack 151 (1988) 469
- Druger, S.D. and M.A. Ratner, The relationship between hopping and coherent motion in dynamically disordered systems 151 (1988) 434
- Du, K.-Y. and D.W. Setser, A lower limit for  $\Delta H_f^\circ(\text{NF})$  and the excitation transfer reactions of  $\text{N}_2(\text{A}^3\Sigma_u^+)$  with  $\text{NCO}(\tilde{\text{X}}^2\Pi_i)$  and  $\text{NF}(\text{X}^3\Sigma^-)$  153 (1988) 393
- Dubicki, L., E. Krausz, M. Riley and I. Yamada, Structured d-d fluorescence from  $\text{CuF}_6^{4-}$   $\text{CuF}_6^{4-}$  doped in cubic and tetragonal perovskites 157 (1989) 315
- Dubreuil, D., see P. Monchicourt 152 (1988) 336
- Ducasse, L., see C. Eckert 153 (1988) 357
- Dudde, R., see M.L.M. Rocco 160 (1989) 366
- Dunbar, R.C., see M.S. Ahmed 151 (1988) 128
- Duncan, M.A., see P.Y. Cheng 152 (1988) 341; 156 (1989) 420
- Dunlop, J.R., J. Karolczak and D.J. Clouthier, Pyrolysis jet spectroscopy 151 (1988) 362
- Dunlop, J.R., J. Karolczak and D.J. Clouthier, Pyrolysis jet spectroscopy, Chem. Phys. Letters 151 (1988) 362. Erratum 154 (1989) 613
- Dunne, L.J., Quasiclassical dynamical study of the reaction  $\text{O}(^1\text{D}) + \text{HD}(^1\Sigma^+) \rightarrow \text{OD}/\text{OH}(^2\Pi) + \text{H}/\text{D}(^2\text{S})$  on a two-valued potential energy surface 158 (1989) 535
- Dunning, F.B., see C.W. Walter 154 (1989) 409
- Duran, M., see J.L. Andrés 153 (1988) 82
- Durante, N., see G.P. Arrighini 159 (1989) 56
- Durant Jr., J.L. and F.P. Tully, Kinetic study of the reaction between CN and  $\text{O}_2$  from 295 to 710 K 154 (1989) 568

*Master index to volumes 151-160*

Düren, R., G. Hilrichs, M. Liesner and S. Mohr, Vibrational predissociation of OCS clusters excited near the $\nu_3$ vibration of the monomer	160 (1989) 602
Dutta, R., see A. Nag	157 (1989) 83
Dye, R.C., see M.E. Morrow	158 (1989) 499
Dykstra, C.E., see J.D. Augspurger	158 (1989) 399
Dzugan, T.P., see M.F. Cai	155 (1989) 430

- Easter, D.C., M.S. El-Shall, M.Y. Hahn and R.L. Whetten, Spectroscopic manifestations of structural shell filling in (benzene)<sub>N</sub> clusters, *N*=1-20 157 (1989) 277
- Eaton, G.H., see S.F.J. Cox 160 (1989) 85
- Ebben, M., see M. Scotoni 155 (1989) 233
- Ebbesen, T.W., see P.V. Kamat 157 (1989) 384
- Echargui, M.A., see Y. Garrabos 160 (1989) 250
- Eckert, C., F. Heisel, J.A. Miehe, R. Lapouyade and L. Ducasse, Intramolecular charge-transfer fluorescence of a new class of sterically hindered bichromophoric molecules 153 (1988) 357
- Eckhardt, C.J., see P.D. Ries 153 (1988) 223
- Eckhardt, C.J., see M.E. Morrow 158 (1989) 499
- Edelstein, N., see P.A. Tanner 152 (1988) 140
- Edrei, R. and A. Persky, The temperature dependence of the rate constant for the reaction  $F + HBr \rightarrow HF + Br$  157 (1989) 265
- Eftaxias, K., P.E. Fielding and G. Lehmann, Mo<sup>5+</sup> in synthetic zircon crystals 160 (1989) 36
- Eggers, D.F., see G.W. Bryant 151 (1988) 309
- Eicke, H.-F., see M. Borkovec 157 (1989) 457
- Eisenthal, K.B., see R.M. Bowman 155 (1989) 99
- Eisenthal, K.B., see M.C. Goh 157 (1989) 101
- Eisenthal, K.B., see F.H. Long 160 (1989) 464
- Ejiri, A., see K. Nakagawa 155 (1989) 278
- El-Ahmed, Z.M., see T.S. Akasheh 152 (1988) 414
- Elets'kii, A.V. and E.V. Stepanov, Non-linear theory of sound wave amplification in non-equilibrium molecular gases 153 (1988) 313
- Eliades, M., see K. McMillan 152 (1988) 87
- Eller, K., D. Sülzle and H. Schwarz, On the generation and identification of stable HCN/Cu(0) and HNC/Cu(0) complexes in the gas phase using neutralization/reionization mass spectrometry (NRMS) 154 (1989) 443
- Ellinger, Y., see G. Hennico 152 (1988) 207
- Elsaesser, T., see F. Laerner 156 (1989) 381
- El-Sayed, M.A., see L. Song 152 (1988) 281
- El-Sayed, M.A., see H.J. Hwang 160 (1989) 243
- El-Shall, M.S., see D.C. Easter 157 (1989) 277
- El-Shall, M.S., Silicon-nitrogen multiple bonding: theoretical study of silanitrides and silaisocyanides 159 (1989) 21
- El'tsov, K.N., G.Ya. Zueva, A.N. Klimov, V.V. Martynov and A.M. Prokhorov, Surface-enhanced Raman scattering observed on chlorinated Cu(111) 158 (1989) 271
- Endo, Y., H. Kanamori and E. Hirota, Millimeter- and submillimeter-wave spectra of the vibrationally excited CCD radical 160 (1989) 280
- Engel, P.S., see J.T. Miller 158 (1989) 179
- Engel, V., H. Metiu, R. Almeida, R.A. Marcus and A.H. Zewail, Molecular state evolution after excitation with an ultra-short laser pulse: a quantum analysis of NaI and NaBr dissociation 152 (1988) 1
- Engel, V. and H. Metiu, The study of NaI predissociation with pump-probe femtosecond laser pulses: the use of an ionizing probe pulse to obtain more detailed dynamic information 155 (1989) 77
- Engel, Y.M., see C. Wittig 153 (1988) 411
- Engelhardt, B., see K.H. Becker 154 (1989) 342

Engelhardt, B., see W. Bauer	158 (1989) 321
Engelhardt, G., J.-Ch. Buhl, J. Felsche and H. Foerster, Resolution improvement of solid-state two-dimensional $^{23}\text{Na}$ nutation NMR spectra by magic angle spinning	153 (1988) 332
Engels, B., S.D. Peyerimhoff, S.P. Karna and F. Grein, The hyperfine coupling constants of the five lowest states of CH: an ab initio MRDCI study	152 (1988) 397
Englman, R., An electronic-vibrational interpretation of algebraic Hamiltonians	152 (1988) 442
Ernst, R.R., see S. Pfenninger	151 (1988) 199
Ernst, R.R., see C. Griesinger	152 (1988) 239
Ernst, R.R., see C. Bühlmann	154 (1989) 285
Ernst, R.R., see M.A. McCoy	159 (1989) 587
Ernst, R.R., see H. Cho	160 (1989) 391
Ernst, W.E., J.O. Schröder and B. Schaal, Hyperfine structure of the $X^2\Sigma^+$ and $B^2\Sigma^+$ states of SrI measured by polarization spectroscopy	155 (1989) 47
Ernst, W.E., see J. Kändler	155 (1989) 470
Ernsting, N.P., Transient optical absorption spectroscopy of the photochemical spiro-pyran-merocyanine conversion	159 (1989) 526
Ertl, G., see B. Pettinger	151 (1988) 151
Estrade-Szwarckopf, H., see I. Palchan	157 (1989) 321
Etcheberry, J.-R., see J. Vergès	159 (1989) 315
Etemad, S., see G.J. Blanchard	158 (1989) 329
Eura, S., see H. Masuhara	156 (1989) 446
Evans, M.W., On the symmetry and molecular dynamical origin of magneto chiral dichroism: "spin chiral dichroism" in absolute asymmetric synthesis	152 (1988) 33
Evans, M.W., Time-asymmetric cross correlation functions in liquid water induced by electric field combinations: a computer simulation	158 (1989) 375
Evelo, R.G., see S.A. Dikanov	154 (1989) 34
Evelo, R.G., S.A. Dikanov and A.J. Hoff, Electron spin-echo envelope modulation (ESEEM) studies of the tyrosyl radical $D^\cdot$ of plant photosystem II	157 (1989) 25
Even, R., J. Simon and D. Markovitsi, Optical properties of thin films of molecular semiconductors	156 (1989) 609
Even, U., N. Ben-Horin and J. Jortner, Hierarchal isomerization of molecular clusters	156 (1989) 138
Evleth, E.M., see E. Kassab	153 (1988) 522
EWig, C.S. and J. Tellinghuisen, Ab initio study of excited states of $\text{CN}^-$ stabilized in point-charge lattices	153 (1988) 160
Eyal, M., see D. Brusilovsky	153 (1988) 203
Eyal, M., see R. Reisfeld	153 (1988) 210; 160 (1989) 43



- Fabelinsky, V.I., G. Marowsky, V.V. Smirnov and J. Arnold, A CARS investigation of CS<sub>2</sub> photofragmentation products 156 (1989) 159
- Fabian, J., see M. Nepraš 159 (1989) 366
- Fain, B., see S.H. Lin 155 (1989) 216
- Fain, B. and S.H. Lin, Avalanche phenomenon in UV laser-induced desorption 157 (1989) 233
- Fairén, V., see V. López 160 (1989) 502
- Fajardo, M.E., see N. Schwentner 154 (1989) 237
- Fang, C.C., see J.M. Parson 152 (1988) 330
- Farnell, L. and J.F. Ogilvie, Comment on "Ab initio molecular orbital calculation of the methyl nitrite syn-anti isomerization potential" 156 (1989) 129
- Farrelly, D., see K. Krantzman 152 (1988) 196
- Fayer, M.D., see L.R. Narasimhan 152 (1988) 287
- Fayer, M.D., see K.A. Littau 159 (1989) 1
- Fedrigo, S., see W.A. Saunders 156 (1989) 14
- Felsche, J., see G. Engelhardt 153 (1988) 332
- Feltz, A., see C. Jäger 154 (1989) 45
- Feng, P., see K. Balasubramanian 159 (1989) 452
- Ferguson, E.E., Reactions of NNOH<sup>+</sup> and HNNO<sup>+</sup> ions with CH<sub>4</sub> and NO 156 (1989) 319
- Ferguson, E.E., see C.R. Albertoni 157 (1989) 159
- Fernández, A., Sequence dependence for the melting of globular states in heteropolymers 154 (1989) 396
- Feron, P., F. Perales, B. Decomps, J. Robert, J. Reinhardt, J. Baudon and H. Haberland, Differential measurements on Ne<sup>+</sup> (2p<sup>5</sup>3s<sup>3</sup>P<sub>0,2</sub>)-Ne collisions in the hyperthermal energy range 160 (1989) 555
- Ferrarini, A., G. Moro, P.L. Nordio and A. Polimeno, Conformational processes and cooperativity effects in chain molecules 151 (1988) 531
- Ferretti, A., see R. Cimiraglia 151 (1988) 38
- Fessenden, R.W., see A. Samanta 153 (1988) 406
- Fessmann, J., N. Rösch, E. Ohmes and G. Kothe, Molecular dynamics studied by transient ESR nutation spectroscopy of photoexcited triplet states: chlorophyll *a* in liquid crystalline matrix 152 (1988) 491
- Fielding, P.E., see K. Eftaxias 160 (1989) 36
- Figari, G., see V. Magnasco 156 (1989) 585; 160 (1989) 469
- Figuera, J.M., see M. Castillejo 157 (1989) 41
- Fijan, D., D. Veža and G. Pichler, Photochemical production of the electronically excited NaCd excimer 154 (1989) 126
- Fink, M., see C.K. Teh 158 (1989) 351
- Fink, W.H., see A. Paul 153 (1988) 121
- Finkele, U., see W. Holzapfel 160 (1989) 1
- Fischer, D.A., see J.L. Gland 151 (1988) 227
- Fischer, R.A., P.L. Gertitschke, J. Manz and H.H.R. Schor, Shape, Feshbach, and "avoided crossing" resonances of the collinear F+DBr reaction 156 (1989) 100
- Fleischman, S.H., see D.J. Tobias 156 (1989) 256
- Fleming, G.R., see S.K. Kim 159 (1989) 543
- Flom, S.R., G.C. Walker, L.E. Lynch, L.L. Miller and P.F. Barbara, Degenerate four-wave mixing experiments on polyacene quinones 154 (1989) 193
- Focher, B., G. Savelli, G. Torri, G. Vecchio, D.C. McKenzie, D.F. Nicoli and C.A. Bunton, Micelles of 1-alkyl glucoside and maltoside: anomeric effects on structure and induced chirality 158 (1989) 491



- Foerster, H., see G. Engelhardt 153 (1988) 332
- Foggi, P., see R. Bini 151 (1988) 236
- Fonseca, T. and M. Cunha, Time-dependent solvation effects on the rate of nonradiative electronic relaxation in solution 155 (1989) 385
- Forrer, J., see S. Pfenninger 151 (1988) 199
- Forst, W., On the relation between the energy dependence of  $\langle \Delta E \rangle$  and of its ensemble (or bulk) average  $\langle \Delta E \rangle$  157 (1989) 374
- Fouassier, J.P., D.J. Lougnot and J.C. Scaiano, A laser spectroscopy investigation of excited-state processes in  $\alpha$ -sulphonylketones 160 (1989) 335
- Foucrault, M., M. Picard and J.M. Leclercq, On the use of adapted basis sets for variational treatments of multi-well potential surfaces 156 (1989) 599
- Fouquet, J., see E. Kassab 153 (1988) 522
- Fowler, P.W., Hyperpolarisation effects on the electric field gradient at a nucleus 156 (1989) 494
- Fox, M.A., see E.S. Smotkin 152 (1988) 265
- Fox, M.A., see H. Böttcher 158 (1989) 453; 160 (1989) 121
- Fragnito, H.L., J.-Y. Bigot, P.C. Becker and C.V. Shank, Evolution of the vibronic absorption spectrum in a molecule following impulsive excitation with a 6 fs optical pulse 160 (1989) 101
- Fraissard, J., see M.A. Springuel-Huet 154 (1989) 299
- Fraissard, J., see Q.J. Chen 159 (1989) 117
- Francisco, J.S. and Y. Zhao, Energetics of the reactions of FCO with  $O_2$  using unrestricted Møller-Plesset perturbation theory with spin annihilation 153 (1988) 296
- François, J.P., see J.M.L. Martin 157 (1989) 217; 159 (1989) 122
- Frank, K.-H., see M.L.M. Rocco 160 (1989) 366
- Frankevich, E.L., A.A. Lymarev and A.I. Sokolik, Dependence of the quantum yield of free carriers on recombination rate - a new feature of quasi-one-dimensional photoconductors. Application to polydiacetylene 159 (1989) 113
- Franko, M. and C.D. Tran, Temperature effect on photothermal lens phenomena in water: photothermal defocusing and focusing 158 (1989) 31
- Franz, J.A., see C. Sosa 159 (1989) 148
- Frasinski, L.J., see P.A. Hatherly 159 (1989) 355
- Freedman, T.B., see L.A. Nafie 154 (1989) 260
- Freiser, B.S., see J.R. Gord 153 (1988) 577
- Freude, D., see J. Haase 152 (1988) 254; 156 (1989) 328
- Friedl, R.R., see A. Wahner 152 (1988) 507
- Friedrich, J., see R. Hirschmann 151 (1988) 60
- Friesner, R.A., see J.-P. Brunet 153 (1988) 425
- Frisch, M.J., see M. Head-Gordon 153 (1988) 503
- Fröhlich, T., see J. Haase 156 (1989) 328
- Fromherz, P., Dissipative spinodal condensation of membrane proteins 154 (1989) 146
- Frueholz, R.P., see N.D. Bhaskar 154 (1989) 175
- Frum, C.I., see L. Adamowicz 157 (1989) 496
- Fueno, H., see A. Tachibana 160 (1989) 353
- Fueno, T., see Y. Takahara 157 (1989) 211; 158 (1989) 95
- Fueno, T., see K. Yamaguchi 159 (1989) 459, 465
- Fujii, N. and K.S. Shin, Rate constant for  $H + O_2 \rightarrow O + OH$  by laser absorption spectroscopy of OH in shock-heated  $H_2-O_2$ -Ar mixtures 151 (1988) 461
- Fujimura, Y., see T. Noguchi 155 (1989) 177

*Master index to volumes 151-160*

Fujita, M., see Y. Kotagiri	158 (1989) 440
Fujita, Y. and S. Ikawa, Effect of temperature on the hydrogen bond distribution in water as studied by infrared spectra	159 (1989) 184
Fujitake, M., see K. Tanaka	153 (1988) 237
Fuke, K., see S. Nonose	158 (1989) 152
Fukumura, H., see H. Masuhara	156 (1989) 446
Fukushima, M., see H. Hiratsuka	157 (1989) 35
Funabashi, M., see H. Kobashi	160 (1989) 261
Furlan, A., S. Wülfert and S. Leutwyler, CARS spectra of the HCl dimer in supersonic jets	153 (1988) 291
Furlani, A., see M.V. Russo	155 (1989) 599
Fushiki, M., An anisotropic hypernetted chain approximation for the spherical cell model	154 (1989) 77
Futami, H., see M. Koyanagi	154 (1989) 577
Futrell, J., see J. Biggerstaff	151 (1988) 507

- Gabriel, H., see I. Gersonde 153 (1988) 273
- Gadéa, F.X., J.M. L'Hermite, G. Rahmat and R. Vetter, Hyperfine structure effect in the Cs(7P) + H<sub>2</sub> reaction. Experimental observation and theoretical interpretation 151 (1988) 183
- Gadhi, J., G. Wlodarczak, J. Legrand and J. Demaison, The dipole moments of methyl bromide and methyl iodide 156 (1989) 401
- Gagel, R., see G. Angel 156 (1989) 169
- Galiazzo, G., see G. Gennari 157 (1989) 194
- Gallhuber, E., see T. Schönherr 158 (1989) 519
- Garcia, E., see M. Baer 158 (1989) 362
- Garcia-Moreno, I., see M. Castillejo 157 (1989) 41
- Garrabos, Y., V. Chandrasekharan, M.A. Echargui and F. Marsault-Herail, Density effect on the Raman Fermi resonance in the fluid phases of CO<sub>2</sub> 160 (1989) 250
- Gärtner, W., see H.-W. Trissl 158 (1989) 515
- Garvey, J.F., see M.T. Coolbaugh 156 (1989) 19
- Garzón, I.L., X.P. Long, R. Kawai and J.H. Weare, Structural and dynamical properties of van der Waals clusters with impurities 158 (1989) 525
- Gaspar Jr., R., W.S. Brey Jr., A. Qiu and E.R. Andrew, Phosphorus-31 magnetic relaxation of adenosine 5'-monophosphate, adenosine 5'-diphosphate and adenosine 5'-triphosphate in solution 156 (1989) 619
- Gates, S.M., C.M. Greenlief, D.B. Beach and R.R. Kunz, Reactive sticking coefficient of silane on the Si(111)-(7×7) surface 154 (1989) 505
- Gates, S.M., see C.M. Greenlief 159 (1989) 202
- Gatteschi, D., see A. Bencini 156 (1989) 341
- Gatteschi, D., C. Zanchini, O. Kahn and Y. Pei, Single-crystal EPR spectra of the first alternating bimetallic chain compound MnCu<sub>4</sub>(obp)(H<sub>2</sub>O)<sub>3</sub>·H<sub>2</sub>O (obp=oxamido bis(N,N'-propionato)) 160 (1989) 157
- Gäumann, T., see M. Bensimon 157 (1989) 97
- Gauss, J. and D. Cremer, Analytical differentiation of the energy contribution due to triple excitations in fourth-order Möller-Plesset perturbation theory 153 (1988) 303
- Gautney, J., see D.K. Paul 160 (1989) 559
- Gazzillo, D. and G. Pastore, Equation of state for symmetric non-additive hard-sphere fluids: an approximate analytic expression and new Monte Carlo results 159 (1989) 388
- Geers, A., J. Kappert, F. Temps and J.W. Wiebrecht, State-selective vibrational excitation of OH(X<sup>2</sup>Π) radicals by stimulated emission pumping 155 (1989) 614
- Geertsen, J., see C. Sosa 159 (1989) 148
- Geiger, L.C. and B.M. Ladanyi, Molecular dynamics simulation study of nonlinear optical response of fluids 159 (1989) 413
- Gemperle, C., see H. Cho 160 (1989) 391
- Gennari, G., G. Galiazzo and P. Bortolus, Dual emission of some styrylquinolines in alcohols 157 (1989) 194
- George, S.M., see N.J. Tro 159 (1989) 599
- George, T.F., see Y.S. Kim 152 (1988) 453
- Georgiou, A.S., D.J. Millen, Z. Kisiel and A.C. Legon, Analysis of a Coriolis interaction between the in-plane and out-of-plane hydrogen bond bending modes in the dimer of oxirane and hydrogen fluoride 155 (1989) 447
- Gerber, R.B., see L. Shen 155 (1989) 119
- Gerber, R.B., see G. Petrella 158 (1989) 250
- Gerber, R.B., R. Alimi and V.A. Apkarian, Ion migration following charge transfer reactions in rare-gas solids: the role of hole hopping 158 (1989) 257

- Germann, G.J. and J.J. Valentini, CARS study of the OH(<sup>2</sup>Π) radical product of the photodissociation of H<sub>2</sub>O<sub>2</sub> at 266 nm 157 (1989) 51
- Gershenzon, Yu.M., see M.A. Ioffe 154 (1989) 131
- Gerson, F. and X.-Z. Qin, The radical cation of naphthalene: first correct analysis of its ESR spectrum 153 (1988) 546
- Gersonde, I., H. Gabriel, H. Kühle and N. Schwentner, Influence of lattice structure on energy transfer among randomly distributed substitutional impurities 153 (1988) 273
- Gertitschke, P.L., see R.A. Fischer 156 (1989) 100
- Gervasi, O., see M. Baer 158 (1989) 362
- Ghoshal, S.K., Resonant third-order optical nonlinearity in polypyrrole 158 (1989) 65
- Giambiagi, M., M.S. de Giambiagi and J.M. Pires, Molecular hardness and Roothaan energy equations 152 (1988) 222
- Giardini-Guidoni, A., see V. Di Napoli 154 (1989) 217
- Gibb, M.D. and H.K. Haugen, Linear and nonlinear spectroscopy at a cesium vapour/dielectric interface using a semiconductor laser 159 (1989) 573
- Gijbels, R., see J.M.L. Martin 157 (1989) 217; 159 (1989) 122
- Gilbert, R.G., see A.R. Whyte 152 (1988) 377
- Gilchrist, J. le G., Anomalous dielectric permittivity of ammonium perchlorate below 40 K 156 (1989) 76
- Gillbro, T. and R.J. Cogdell, Carotenoid fluorescence 158 (1989) 312
- Gillie, J.K., see I.-J. Lee 156 (1989) 227
- Gillilan, R.E. and W.P. Reinhardt, Barrier recrossing in surface diffusion: a phase-space perspective 156 (1989) 478
- Giomini, M., A.M. Giuliani, E. Trotta and C.A. Boicelli, The use of NMR parameters for the evaluation of the critical micelle concentration of lecithin in reverse micellar systems 158 (1989) 334
- Giro, G., P.G. Di Marco, M. Pizzoli and G. Ceccorulli, Detection of polymer thermal transitions by excimer fluorescence. Poly-N-vinylcarbazole, Chem. Phys. Letters 150 (1988) 159. Erratum 153 (1988) 583
- Giroud, M. and O. Nédélec, Temperature dependence of the Cd\*(5<sup>3</sup>P<sub>1</sub>) quenching cross sections for collision with H<sub>2</sub> or D<sub>2</sub> 152 (1988) 167
- Giroud-Godquin, A.-M., see P. Maldivi 157 (1989) 552
- Giroux, L., M.H. Back and R.A. Back, A comment on the rotational isomerization of ethylene 154 (1989) 610
- Gislason, E.A. and M. Sizun, High energy model for chemical reactions: comparison with trajectory results 158 (1989) 102
- Gitti, R., see H.C. Dorn 155 (1989) 227
- Giuliani, A.M., see M. Giomini 158 (1989) 334
- Gland, J.L., F. Zaera, D.A. Fischer, R.G. Carr and E.B. Kollin, Ethylidyne formation rates on the Pt(111) surface 151 (1988) 227
- Glasbeek, M., see E. van Oort 154 (1989) 587
- Glass, T.E., see H.C. Dorn 155 (1989) 227
- Glinski, R.J. and C.D. Taylor, Effects of isotopic substitution on the chemiluminescence spectra obtained during the reaction of F<sub>2</sub> with CS<sub>2</sub> 155 (1989) 511
- Goddard, J.D., A computational study of the HCCO and HCCS radicals 154 (1989) 387
- Godfrey, D.C., see B.E. Hayden 158 (1989) 18
- Godfrey, P.D., see R.D. Brown 156 (1989) 61
- Goede, S.J., see F. Stroth 160 (1989) 105

- Goh, M.C. and K.B. Eisenthal, The energetics of orientation at the liquid-vapor interface of water 157 (1989) 101
- Goldbeck, R.A., T.D. Dawes, S.J. Milder, J.W. Lewis and D.S. Kliger, Measurement of magnetic circular dichroism (MCD) on a nanosecond timescale 156 (1989) 545
- Goldenberg, M.Ya., see A.A. Ioffe 156 (1989) 425
- Goldman, S., A radially accurate perturbation theory for molecular liquids: the structure of nitrogen 154 (1989) 536
- Gole, J.L., see S.H. Cobb 156 (1989) 197
- Golombok, M. and D.B. Pye, Multimode stimulated Raman scattering in fuel droplets 151 (1988) 161
- Gondo, Y., see M. Ata 157 (1989) 19
- Goodson, D.Z., A.M. Levine and E. Pollak, Local-mode dynamics of linear symmetric molecules in condensed phases 151 (1988) 557
- Gopala Rao, R.V. and D. Debnath, Study of particle interactions in microemulsion systems 157 (1989) 180
- Gord, J.R., S.W. Buckner and B.S. Freiser, Laser desorption of metal cluster ions from modified metal surfaces 153 (1988) 577
- Gordon, E.B., V.V. Khmelenko, A.A. Pelmenov, E.A. Popov and O.F. Pugachev, Impurity-helium van der Waals crystals 155 (1989) 301
- Gordon, M.S., K.K. Baldridge, D.E. Bernholdt and R.J. Bartlett, The transition state and barrier heights for the reaction  $O(^3P) + HCl \rightarrow OH + Cl$  158 (1989) 189
- Gordon, R.J., see R. Callaghan 158 (1989) 531
- Gormin, D. and M. Kasha, Triple fluorescence in aminosaliclates. Modulation of normal, proton-transfer, and twisted intramolecular charge-transfer (TICT) fluorescence by physical and chemical perturbations 153 (1988) 574
- Gorokhovskii, A.A. and V.V. Palm, Resonance fluorescence of the impurity in an amorphous polymer measured using an optical filter based on spectral hole burning 153 (1988) 328
- Gourdon, A., see J.-P. Launay 160 (1989) 89
- Grabandt, O., C.A. de Lange, R. Mooyman, T. van der Does and F. Bickelhaupt, He(I) photoelectron spectroscopy of diisocyanogen (CNNC) 155 (1989) 221
- Grabandt, O., C.A. de Lange and R. Mooyman, He(I) photoelectron spectroscopy of InF 160 (1989) 359
- Grabowska, A., A. Mordziński, N. Tamai and K. Yoshihara, Picosecond kinetics of the excited-state intramolecular proton transfer reaction: confirmation of the intrinsic potential barrier in 2,5-bis-(benzoxazolyl)-hydroquinone 153 (1988) 389
- Grabowski, S.J. and T.M. Krygowski, Atom-atom potential calculations on two mechanisms for proton transfer in carboxylic acid dimers 151 (1988) 425
- Grabowski, Z.R., see J. Karpiuk 160 (1989) 451
- Grandinetti, F., see F. Bernardi 153 (1988) 309
- Grätzel, M., see G. Rothenberger 154 (1989) 165
- Gray, C.G., see C.G. Joslin 154 (1989) 369
- Green, J.C., see D.L. Clark 154 (1989) 326
- Greenlief, C.M., see S.M. Gates 154 (1989) 505
- Greenlief, C.M., S.M. Gates and P.A. Holbert, Absolute coverage and decomposition kinetics of mono-, di-, and tri-hydride phases on Si(111)-(7×7) 159 (1989) 202
- Gregori, A., see A. De Santis 160 (1989) 55
- Grein, F., see B. Engels 152 (1988) 397
- Greiner, S.P., J. Winzenburg, B. von Maltzan, C.J. Winscom and K. Möbius, A resonance Raman study of selected tetraphenylporphyrin dimers and their monomer constituents 155 (1989) 93
- Greis, J., see J. Ullrich 155 (1989) 363

Griesinger, C. and R.R. Ernst, Cross relaxation in time-dependent nuclear spin systems: invariant trajectory approach	152 (1988) 239
Grigera, J.R., F. Vericat, G. Ruderman and J.R. de Xammar Oro, On the threshold frequency of long-range interactions in physiological solutions	156 (1989) 615
Griller, D., see J.A. Martinho Simões	158 (1989) 175
Grimson, M.J., see P.J. Atkinson	151 (1988) 494
Grishin, Yu.A., see N.I. Avdievich	155 (1989) 141
Gritsenko, O.V., see V.G. Malkin	152 (1988) 44
Groenen, E.J.J., see M. Ros	154 (1989) 29
Guan, Y., see T. Uzer	152 (1988) 405
Guarino, A., see F. Bernardi	153 (1988) 309
Güdel, H.U., see C. Reber	154 (1989) 425
Güdel, H.U., see S.M. Jacobsen	158 (1989) 77
Guerin, B., see W. Tam	154 (1989) 93
Guest, M.F., see D.L. Clark	154 (1989) 326
Guest, M.F., see N.A. Burton	155 (1989) 195
Guichard, V., see G. Buntinx	153 (1988) 279
Guidotti, C., see G.P. Arrighini	159 (1989) 56
Guillon, D., see P. Maldivi	157 (1989) 552
Guillot, B., see M. Krauss	158 (1989) 142
Guldborg, A., Some properties of symmetrized transition density matrices based on configuration interaction wavefunctions	154 (1989) 487
Guo, X. and G.D. Mendenhall, Direct determination of electron-hole trap depth from delayed luminescence of poly-(N-vinylcarbazole)	152 (1988) 146
Gupta, Y.M., see C.S. yoo	159 (1989) 178
Gussoni, M., see M.N. Ramos	151 (1988) 397; 152 (1988) 528
Gussoni, M., M.N. Ramos, C. Castiglioni and G. Zerbi, Ab initio counterpart of infrared atomic charges: charge fluxes	160 (1989) 200
Gütlich, P., see A. Hauser	152 (1988) 468
Gutman, I., On the dependence of the total $\pi$ -electron energy of a benzenoid hydrocarbon on the number of Kekulé structures	156 (1989) 119
Gutman, I., see S.-L. Lee	157 (1989) 229
Gutman, I., see Y. Jiang	159 (1989) 159
Guyon, P.-M., see K. Ito	151 (1988) 121
Guzielski, V., see J. Wörmer	159 (1989) 321
Gvishi, R. and R. Reisfeld, An investigation of the equilibrium between various forms of oxazine-170 by means of absorption and fluorescence spectroscopy	156 (1989) 181



Ha, T.-K., see M.T. Nguyen	158 (1989) 135
Haarer, D., see W. Richter	159 (1989) 235
Haas, Y., see H. Zuckermann	151 (1988) 323
Haase, J., D. Freude, H. Pfeifer, E. Lippmaa and P. Sarv, Two-pulse free induction decay quadrupole NMR	152 (1988) 254
Haase, J., D. Freude, T. Fröhlich, G. Himpel, F. Kerbe, E. Lippmaa, H. Pfeifer, P. Sarv, H. Schäfer and B. Seiffert, $^{27}\text{Al}$ magic-angle-spinning NMR studies of aluminium nitride ceramics	156 (1989) 328
Habenicht, W., see G. Reiser	152 (1988) 119
Haberland, H., see P. Feron	160 (1989) 555
Hacaloglu, J., S. Süzer, T. Oster and E. Illenberger, Negative-ion formation in fluoroacetonitrile and chloroacetonitrile following low energy electron impact	153 (1988) 268
Hacaloglu, J. and L. Andrews, A chemical ionization source of molecular ions for matrix-isolation spectroscopy	160 (1989) 274
Hackett, P.A., see J.M. Parnis	151 (1988) 485
Haegel, F.-H. and A. Wokaun, Preparation of SERS-active silver colloids by photosensitizing cyanine dyes	157 (1989) 328
Häger, J., see H. Kuze	153 (1988) 569
Haggquist, G.W. and R.D. Burkhart, Optical anisotropy of phosphorescence from photo-selected benzophenone molecules in polystyrene matrices	152 (1988) 56
Hahn, M.Y., see D.C. Easter	157 (1989) 277
Hall, G.E. and T.J. Sears, Probing chemical reaction dynamics by rotational spectroscopy: the OH rotational distribution in the reaction $\text{H} + \text{O}_2 \rightarrow \text{OH} + \text{O}$	158 (1989) 184
Hall, R.W., Finite temperature effects in $\text{Na}_3^+$ and $\text{Na}_3$ : a path integral Monte Carlo study	160 (1989) 520
Hallstadius, H., see H. Bergström	155 (1989) 27
Halpern, B. and M. Kori, Comment on "Desorption of carbon dioxide molecules from a Pt(111) surface: a stochastic classical trajectory approach"	159 (1989) 605
Halpern, J.B., see C.G. Atkins	152 (1988) 81
Halpern, J.B., G.E. Miller and H. Okabe, The reaction of CN radicals with cyanoacetylene	155 (1989) 347
Halpern, J.B., see R.G. Briggs	156 (1989) 363
Halstead, D., see S. Holloway	154 (1989) 181
Hamaguchi, H., see T. Tahara	152 (1988) 135
Hamaguchi, H., see K. Iwata	157 (1989) 300
Hamdan, H. and J. Klinowski, $^{27}\text{Al}$ quadrupole nutation NMR studies of amorphous aluminosilicates	158 (1989) 447
Hamdan, M. and A.G. Brenton, First experimental observation of vibrationally excited $\text{NO}^{2+}(\text{X}^2\Sigma^+, \text{A}^2\Pi)$	155 (1989) 321
Hamilton, J.C. and R.J.M. Anderson, The effect of adsorbed CO on azimuthally resolved optical second harmonic generation from Ni(111)	151 (1988) 455
Hammack, W.S., H.G. Drickamer and D.N. Hendrickson, Effect of pressure on the charge-transfer band of the $[\text{Fe}(\text{CN})_6]^{4-}$ dimethyl viologen ion pair	151 (1988) 469
Hammer, R., see G. Pichler	156 (1989) 467
Hammond, R.P., see M.P. Banjavcic	160 (1989) 371
Hampton, T., see I.R. Politzer	159 (1989) 258
Han, P. and D.M. Bartels, H atom reaction rates in solution measured by free induction decay attenuation	159 (1989) 538
Hancock, G., see C.G. Atkins	152 (1988) 81

- Hancock, G., see R.G. Briggs 156 (1989) 363
- Hancock, G. and D.E. Heard, Time-resolved pulsed FTIR emission studies of atom-radical reactions: product chemiluminescence from the  $O(^3P) + CF_2(\tilde{X}^1A_1)$  reaction 158 (1989) 167
- Harrell Jr., J.W., A relaxation time study of the melt, glass, and crystalline phases of 1,6-hexanediol diacrylate 151 (1988) 345
- Harris, K.D.M. and P. Jonsen,  $^2H$  NMR investigation of the dynamic behaviour of *n*-hexadecane in its urea inclusion compound 154 (1989) 593
- Harrison, J.A. and R.G.A.R. MacLagan, Ab initio potential energy surfaces for the reaction of  $BH_2$  with NO 155 (1989) 419
- Harrison, J.A. and H.R. Mayne, The effect of reagent rotation on reactivity: classical decoupling approximations 158 (1989) 356
- Harrison, J.A., see R.F. Meads 160 (1989) 342
- Harrison, R.J. and S. Zarrabian, An efficient implementation of the full-CI method using an  $(n-2)$ -electron projection space 158 (1989) 393
- Hartke, B., R. Kosloff and S. Ruhman, Large amplitude ground state vibrational coherence induced by impulsive absorption in CsI. A computer simulation 158 (1989) 238
- Hartke, B., Sensitivity of resonance Raman spectra to changes in the potential: a time-dependent approach 160 (1989) 538
- Hartmann, F., see P. Baltayan 160 (1989) 549
- Hartmann, F.X., see S.R. Rotman 152 (1988) 311
- Harvey, A.H. and J.M.H. Levelt Sengers, On the  $NaCl-H_2O$  coexistence curve near the critical temperature of  $H_2O$  156 (1989) 415
- Hasan, M., see B. Kirtman 157 (1989) 123
- Hase, W.L., see A.R. Whyte 152 (1988) 377
- Hase, W.L. and X. Hu, A semi-empirical canonical variational transition state theory model for association reactions without potential energy barriers 156 (1989) 115
- Häser, M., see R. Ahlrichs 154 (1989) 104
- Häser, M., see D.J. Swanton 155 (1989) 329
- Hashimoto, H., Y. Mukai and Y. Koyama, Transient Raman spectra of all-trans, 7-cis, 9-cis, 11-cis and 13-cis retinylideneacetaldehyde. Structures of triplet species as revealed by Raman spectroscopy 152 (1988) 319
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- Hassinen, E., see V.P. Bulatov 153 (1988) 258
- Hatano, M., see H. Konami 160 (1989) 163
- Hatherly, P.A., M. Stankiewicz, L.J. Frasinski, K. Codling and M.A. MacDonald, Double photoionisation of methane studied by the triplet coincidence (PEPIPICO) technique 159 (1989) 355
- Haug, K., see A.E. DePristo 155 (1989) 376
- Haugen, H.K., see M.D. Gibb 159 (1989) 573
- Hauser, A., J. Adler and P. Gütllich, Light-induced excited spin state trapping (LIESST) in  $[Fe(2-mephen)_3]^{2+}$  embedded in polymer matrices 152 (1988) 468
- Havlas, Z., see M. Urban 159 (1989) 155
- Hawlicka, E., G. Pálkás and K. Heinzinger, A molecular dynamics study of liquid methanol with a flexible six-site model 154 (1989) 255
- Hawranek, J.P. and M.A. Czarnecki, The infrared dielectric function of liquid  $CD_3CN$  151 (1988) 340

- Hayaishi, T., see K. Ueda 154 (1989) 357
- Hayaishi, T., see S. Nagaoka 154 (1989) 363
- Hayden, B.E. and D.C. Godfrey, Adsorbate-mediated resonant energy transfer during inelastic scattering from Cu(110) 158 (1989) 18
- Hayden, B.E. and C.L.A. Lamont, The energy and angular dependence of dissociative hydrogen adsorption on Cu(110) 160 (1989) 331
- Haydock, C., see P. Ilich 158 (1989) 129
- Hayes, E.F. and R.B. Walker, Direct determination of scattering time delays using the S-matrix version of the Kohn variation method 151 (1988) 537
- Hayman, G.D. and R.A. Cox, UV absorption spectrum and thermochemistry of Cl<sub>2</sub>O<sub>3</sub> formed in the photolysis of OClO-containing mixtures at low temperatures 155 (1989) 1
- Haynes, D.R., see N.J. Tro 159 (1989) 599
- He, J.-W., A model for a phase-transition-related zero-order thermal desorption 151 (1988) 27
- He, T., see P. Zhang 153 (1988) 215
- Head-Gordon, M., J.A. Pople and M.J. Frisch, MP2 energy evaluation by direct methods 153 (1988) 503
- Head-Gordon, M., see K. Raghavachari 157 (1989) 479
- Heard, D.E., see G. Hancock 158 (1989) 167
- Heather, R. and H. Metiu, Rotational coherence effects in the femtosecond photodissociation of ICN 157 (1989) 505
- Hecht, L., see L.D. Barron 154 (1989) 251
- Hecht, L., L.D. Barron and W. Hug, Vibrational Raman optical activity in backscattering 158 (1989) 341
- Hedgecock, I.M., see A.P. Cox 158 (1989) 6
- Heeger, A.J., see J.L. Brédas 154 (1989) 56
- Heenan, R.K., see P.J. Atkinson 151 (1988) 494
- Hegde, M.S., see T. Pradeep 151 (1988) 499
- Heinje, G., W.A.P. Luck and P. Bopp, Estimation of the OH-vibrational frequency shifts from MD simulations of aqueous electrolyte solutions 152 (1988) 358
- Heinzinger, K., see E. Hawlicka 154 (1989) 255
- Heisel, F., see C. Eckert 153 (1988) 357
- Heisel, F., see J.-P. Launay 160 (1989) 89
- Heller, D.F., see Y.B. Band 156 (1989) 405
- Helm, H., see P.C. Cosby 152 (1988) 71
- Hendrickson, D.N., see W.S. Hammack 151 (1988) 469
- Henglein, A., Non-metallic silver clusters in aqueous solution: stabilization and chemical reactions 154 (1989) 473
- Hennico, G., J. Delhalle, M. Raynaud, C. Reynaud and Y. Ellinger, An ab initio study of the electric field influence on the electron distribution of H-CN, CH<sub>3</sub>-CN, CH<sub>2</sub>=CH-CN, and CH<sub>2</sub>=C-(CN)<sub>2</sub> 152 (1988) 207
- Henriet, A., C. Le Sech and F. Masnou-Secuews, Numerical evaluation of two-electron integrals for molecular Rydberg states in systems with two active electrons 158 (1989) 389
- Hensler, G., see T. Schönherr 158 (1989) 519
- Herbst, E. and G. Winnewisser, An experimentally derived torsional potential function for HSSH 155 (1989) 572
- Heritage, J.P., see G.J. Blanchard 158 (1989) 329
- Herndon, W.C., T.P. Radhakrishnan and T.P. Zivkovic, Characteristic and matching polynomials of chemical graphs 152 (1988) 233
- Hertz, O., see H. Böttcher 158 (1989) 453; 160 (1989) 121

- Hess, B., see Zs. Nagy-Ungvarai 156 (1989) 433
- Hess, B.A., see G. Jansen 160 (1989) 507
- Hess, P., see M. Buck 158 (1989) 486
- Hess, W.P. and F.P. Tully, Catalytic conversion of alcohols to alkenes by OH 152 (1988) 183
- Hesselink, G.L.J., see R.A. Huijts 156 (1989) 209
- Heyes, D.M., Simple expressions for the self-diffusion coefficient, shear viscosity and thermal conductivity of Lennard-Jones fluids 153 (1988) 319
- Hidaka, Y., T. Nakamura and H. Kawano, High temperature pyrolysis of  $\text{CF}_3\text{Br}$  in shock waves 154 (1989) 573
- Higuchi, J., see K. Tanigaki 153 (1988) 57
- Higuchi, J., see Y. Shioya 154 (1989) 25
- Higuchi, J., see M. Yagi 160 (1989) 13
- Hikida, T., see Y. Kotagiri 158 (1989) 440
- Hikmet, I., see P. Baltayan 160 (1989) 549
- Hillier, I.H., see D.L. Clark 154 (1989) 326
- Hillier, I.H., see N.A. Burton 155 (1989) 195
- Hillig II, K.W., see M.S. LaBarge 159 (1989) 559
- Hillrichs, G., see R. Dören 160 (1989) 602
- Himpel, G., see J. Haase 156 (1989) 328
- Hipes, P.G., see S.A. Cuccaro 154 (1989) 155; 157 (1989) 440
- Hiraoka, K. and S. Yamabe, Stabilities of the  $\text{N}_3^+(\text{N}_2)_n$  cluster ions with  $n=1-11$  154 (1989) 139
- Hiraoka, K. and T. Mori, Thermochemical stabilities of  $\text{D}_3^+(\text{D}_2)_n$  with  $n=1-10$  157 (1989) 467
- Hiratsuka, H., K. Mori, H. Shizuka, M. Fukushima and K. Obi, Emitting states of benzyl, *p*-fluorobenzyl and *p*-cyanobenzyl radicals 157 (1989) 35
- Hiratsuka, H., see T. Shimada 158 (1989) 435
- Hiraya, A., see I. Tokue 153 (1988) 346
- Hiraya, A., see T. Ibuki 157 (1989) 521; 160 (1989) 152
- Hirayama, S., F. Tanaka and K. Shobatake, Vibronic-level-specific heavy-atom effect on the fluorescence decay of the rare gas complexes of 9-methoxyanthracene 153 (1988) 112
- Hirose, C., see N. Ami 153 (1988) 118
- Hirose, C., see S. Matsunuma 154 (1989) 555
- Hirota, E., see K. Tanaka 153 (1988) 237
- Hirota, E., see Y. Endo 160 (1989) 280
- Hirota, N., see M. Kato 157 (1989) 543
- Hirschmann, R., W. Köhler, J. Friedrich and E. Daltrozzi, Hole burning in excitonic states of long-chain molecular aggregates 151 (1988) 60
- Hirst, P.R., see R.C.T. Slade 155 (1989) 305
- Hliwa, M. and J.-P. Daudey, Theoretical study of the potential curves for the Mg-Ar system: application of a non-symmetric approach for the calculation of dispersion energies 153 (1988) 471
- Ho, C.-J., A.L. Motyka and M.R. Topp, Picosecond time-resolved  $\text{S}_2 \rightarrow \text{S}_0$  fluorescence of xanthone in different fluid solvents 158 (1989) 51
- Hochstrasser, R.M., see M. Lee 153 (1988) 1
- Hochstrasser, R.M., see H.P. Trommsdorff 154 (1989) 463
- Hoef, J., see T. Törring 151 (1988) 520
- Hoef, J. and K.P.R. Nair, The rotational spectra of indium monochloride: molecular constants and breakdown of the Born-Oppenheimer approximation 155 (1989) 273
- Hoff, A.J., see S.A. Dikanov 154 (1989) 34

- Hoff, A.J., see R.G. Evelo 157 (1989) 25
- Hoff, A.J., see R. Vreeker 158 (1989) 24
- Hoffman, N.W., see D.K. Paul 160 (1989) 559
- Hoffman, R.W., see D.D. Beck 159 (1989) 207
- Hoffmann, G., D. Oh, H. Iams and C. Wittig, Reactions of hot H atoms with  $N_2O$  under single-collision, gas-phase conditions and in photoexcited  $N_2O-HBr$  complexes:  $OH(X^2\Pi) + N_2$ ,  $OH(A^2\Sigma) + N_2$ , and  $NH(X^3\Sigma) + NO(X^2\Pi)$  channels 155 (1989) 356
- Hoffmann, G., see Y. Chen 159 (1989) 426
- Hofstra, U., T.J. Schaafsma, G.M. Sanders, M. van Dijk, H.C. van der Plas, D.G. Johnson and M.R. Wasielewski, Picosecond charge separation and triplet formation in a closely spaced photosynthetic model system 151 (1988) 169
- Hoge, D., M. Tüshaus, E. Schweizer and A.M. Bradshaw, The metal-carbon stretch in the vibrational spectrum of CO adsorbed on Pt{111} 151 (1988) 230
- Holbert, P.A., see C.M. Greenlief 159 (1989) 202
- Hollas, J.M. and M.Z. bin Hussein, The  $C(1)-C(\alpha)$  torsional potential function of 2-fluorostyrene from  $S_1-S_0$  fluorescence in a supersonic jet 154 (1989) 14
- Hollas, J.M. and M.Z. bin Hussein, The  $C(1)-C(\alpha)$  torsional potential function of cis- and trans-3-fluorostyrene by supersonic jet spectroscopy 154 (1989) 228
- Hollas, J.M. and J.J.C. Teixeira-Dias, The  $CH_2Cl$  torsional barrier of benzyl chloride studied by gas-phase absorption spectroscopy and ab initio calculations 157 (1989) 31
- Hollas, J.M., see K.H. Hassan 157 (1989) 183
- Hollenstein, H., see H. Bürger 156 (1989) 557
- Hollenstein, H.A., see A.J. Ross 156 (1989) 455
- Holloway, S. and D. Halstead, The scattering of oriented NO from Ag(111) surfaces 154 (1989) 181
- Holmes, J.L., see C.E.C.A. Hop 156 (1989) 251; 159 (1989) 580
- Holten, D., see C. Kirmaier 159 (1989) 251
- Holzappel, W., U. Finkel, W. Kaiser, D. Oesterhelt, H. Scheer, H.U. Stolz and W. Zinth, Observation of a bacteriochlorophyll anion radical during the primary charge separation in a reaction center 160 (1989) 1
- Hong, Y., see T.A. Stephenson 159 (1989) 549
- Hop, C.E.C.A., J.L. Holmes, P.J.A. Ruttink, G. Schaftenaar and J.K. Terlouw, The isomeric ions produced by the gas phase protonation of HNC and HCNO 156 (1989) 251
- Hop, C.E.C.A. and J.L. Holmes, Neutralization-reionization of  $CH_4^+$ : at which stage does fragmentation occur? 159 (1989) 580
- Hopkins, J.B., see Y.J. Chang 156 (1989) 421
- Horiai, K., see H. Uehara 160 (1989) 149
- Horie, O. and G.K. Moortgat, A new transitory product in the ozonolysis of trans-2-butene at atmospheric pressure 156 (1989) 39
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- Horn, P.D., see C.S. yoo 159 (1989) 178
- Horn, T.C.M., U. van Slooten and A.W. Kleyn, Observation of elementary catastrophes in surface scattering 156 (1989) 623
- Horne, D.E., see T.P. Carter 151 (1988) 102
- Hoshino, M., see A. Takematsu 159 (1989) 282
- Hotokka, M. and P. Pyykkö, An ab initio study of bonding trends in the series  $BO_3^{3-}$ ,  $CO_3^{2-}$ ,  $NO_3^-$  and  $O_4$  ( $D_{3h}$ ) 157 (1989) 415

- Hotop, H., see A. Merz 160 (1989) 377
- Houriet, R. and T. Vulpis, Formation of metal cluster ions by gas-phase ion-molecule reactions: the bond energies of  $\text{Cr}^+$  and  $\text{Mn}^+$  154 (1989) 454
- Hovingh, W.J. and R. Parson, Quasiresonant vibration-rotation transfer in atom-diatom collisions: a classical adiabatic interpretation 158 (1989) 222
- Howard, S., see J. Biggerstaff 151 (1988) 507
- Howe, A.M., see P.J. Atkinson 151 (1988) 494
- Howorka, F., see A. Stamatovic 160 (1989) 29
- Hrdina, R., see M. Nepřas 159 (1989) 366
- Hu, J., see X. Wang 157 (1989) 87
- Hu, X., see W.L. Hase 156 (1989) 115
- Hu, Y. and S. Mukamel, Superexchange and electron transfer in the photosynthetic reaction center 160 (1989) 410
- Huang, R., see Z. Ma 154 (1989) 9
- Huang, S., see J.C.-C. Tseng 153 (1988) 401
- Huang, Y.-L., see R. Callaghan 158 (1989) 531
- Huber, J.R., see H.U. Suter 155 (1989) 203
- Huber, J.R., see H.-P. Lutz 155 (1989) 251
- Huber, J.R., see A. Ticktin 156 (1989) 372
- Hudson, A., see I.M. Ahmed 151 (1988) 205; 153 (1988) 583
- Hufnagel, F., see J.K. Vij 155 (1989) 153
- Hug, W., see L. Hecht 158 (1989) 341
- Huijts, R.A. and G.L.J. Hesselink, Length dependence of the second-order polarizability in conjugated organic molecules 156 (1989) 209
- Hummel, A., see M. Tachiya 154 (1989) 497
- Hunt, P.M., see Y.-Y.J. Wu 155 (1989) 69
- Hunt, R.D., see L. Andrews 158 (1989) 564
- Hunten, D.M., see P. Vujkovic Cvijin 159 (1989) 331
- Huo, W.M., see A.M.F. Lau 157 (1989) 108
- Hupp, J.T., see R.L. Blackburn 152 (1988) 528
- Huppert, D., see D. Pines 156 (1989) 223
- Huppert, D., V. Ittah and E.M. Kosower, Static and dynamic electrolyte effects on excited-state behavior 159 (1989) 267
- Huston, A.L., see C.D. Merritt 159 (1989) 349
- Hutson, J.M., Coupled channel bound state calculations: calculating expectation values without wavefunctions 151 (1988) 565
- Huzinaga, S., see S. Katsuki 152 (1988) 203
- Hwang, H.J., D.K. Sensharma and M.A. El-Sayed, Kinetic energy release distribution and the mechanism for evaporation of one and two CsI molecules from sputtered  $\text{Cs}(\text{CsI})_n^+$  clusters 160 (1989) 243
- Hynes, J.T., see E.A. Carter 156 (1989) 472



- Iams, H., see G. Hoffmann 155 (1989) 356
- Ibuki, T., A. Hiraya and K. Shobatake, Photoabsorption spectrum and  $\text{CCl}_2(\tilde{\text{A}}^1\text{B}_1)$  radical formation in the VUV excitation of  $\text{C}_2\text{Cl}_6$  157 (1989) 521
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- Ikawa, S., see Y. Fujita 159 (1989) 184
- Ikeda, H., Y. Kawabe, T. Sakai and K. Kawasaki, Second harmonic generation in non-benzenoid aromatics 157 (1989) 576
- Ikeda, N., H. Baba, H. Masuhara, P. Collart, F.C. De Schryver and N. Mataga, Intramolecular excimer formation of the diastereoisomers of bis[1-(2-pyrenyl)ethyl] ether as revealed by picosecond time-resolved absorption spectroscopy 154 (1989) 207
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- Ilczyszyn, M., H. Ratajczak and J.A. Ladd, Reversible proton transfer phenomenon in the 2,4-dichlorophenol-triethylamine hydrogen-bonded complex studied by low-temperature  $^1\text{H}$  NMR spectroscopy 153 (1988) 385
- Ilich, P., C. Haydock and F.G. Prendergast, Electronic transitions in hydrated indole: a MD INDO/S study 158 (1989) 129
- Illas, F., see E. Vilaseca 159 (1989) 165
- Illenberger, E., see J. Hacaloglu 153 (1988) 268
- Illenberger, E., see J. Lotter 157 (1989) 171
- Imabayashi, S., N. Kitamura and S. Tazuke, Effects of bulky substituents in intramolecular exciplex formation in 1-(1-pyrenyl)-3-N,N-dimethylaminophenylpropane derivatives 153 (1988) 23
- Imai, T., see Y. Inoue 160 (1989) 118
- Imajo, T., T. Imamura and I. Koyano, Collisional quenching of the  $\text{CO}^+ \text{A}^2\Pi(v=1)$  state by He, Ne, Ar,  $\text{N}_2$ , and CO 160 (1989) 143
- Imamura, T., see T. Imajo 160 (1989) 143
- Inchley, A., see R.E. Ballard 151 (1988) 477
- Ingold, K.U., see F.J. Adrian 155 (1989) 333
- Inokuchi, H., see A.L. Verma 159 (1989) 189
- Inokuti, M., M. Kimura and K. Kowari, Energy spectra of subexcitation electrons 152 (1988) 504
- Inoue, T., see A. Tachibana 154 (1989) 403
- Inoue, Y., T. Imai and K. Sato, Different catalytic activity of a Cu thin film deposited on a positive and negative polar ferroelectric surface 160 (1989) 118
- Ioffe, A.A., V.P. Bulatov, V.A. Lozovsky, M.Ya. Goldenberg, O.M. Sarkisov and S.Ya. Umansky, On the reaction of the  $\text{NH}_2$  radical with  $\text{SO}_2$  at 298-363 K 156 (1989) 425
- Ioffe, A.A., see V.P. Bulatov 159 (1989) 171
- Ioffe, M.A., Yu.M. Gershenzon, V.B. Rozenshtein and S.Ya. Umanskii, Non-Arrhenius behavior of the  $\text{F} + \text{H}_2$  reaction rate at 293-700 K 154 (1989) 131
- Iogansen, A.A., see V.P. Bulatov 153 (1988) 258
- Iogansen, A.A., see S.G. Cheskis 155 (1989) 37
- Irdam, E.A., see J.H. Kiefer 159 (1989) 32
- Irion, M.P. and A. Selinger, Fourier transform ion cyclotron resonance studies of sputtered metal cluster ions: the chemistry of  $\text{Cu}_n^+$  with  $\text{O}_2$  158 (1989) 145
- Irzhak, V.I., see A.B. Raukhvarger 155 (1989) 455

- Izenor, N.R. and J. Qi, Anomalous fragmentation in the electron-impact ionization of SF<sub>6</sub> and SiF<sub>4</sub> in Ar clusters 155 (1989) 283
- Ishida, K., Spin and charge densities from the Hiller-Sucher-Feinberg identity: H<sub>2</sub><sup>+</sup> and BeH 158 (1989) 217
- Ishiguro, A., see T. Ishiwata 159 (1989) 594
- Ishiguro, S., see T. Radnai 159 (1989) 532
- Ishii, T., see T. Uemura 151 (1988) 217
- Ishikawa, S., see A. Tachibana 154 (1989) 403; 160 (1989) 353
- Ishikawa, Y., see S. Arai 151 (1988) 516
- Ishikawa, Y., H. Sekino and R.C. Binning Jr., Relativistic many-body perturbation theory calculations on Be, Ne<sup>6+</sup>, Ar<sup>14+</sup> and Ne 160 (1989) 206
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- Islam, M.S. and A.K. Ray, Many-body perturbation theory applied to small germanium clusters 153 (1988) 496
- Isomura, S., see S. Arai 151 (1988) 516
- Itaya, A., see H. Masuhara 156 (1989) 446
- Ito, K., P. Lablanquie, P.-M. Guyon and I. Nenner, Dissociative photoionisation of H<sub>2</sub> at 27-40 eV 151 (1988) 121
- Ito, M., see K. Ajito 158 (1989) 193
- Ito, O., see M. Terazima 160 (1989) 319
- Itoh, T., The evidence showing that the intersystem crossing yield of benzaldehyde vapour is unity 151 (1988) 166
- Itoh, T., Evaluation of the coupling constants between the 2<sup>1</sup>A<sub>g</sub>(S<sub>1</sub>) and 1<sup>1</sup>B<sub>u</sub>(S<sub>2</sub>) states for diphenylhexatriene and diphenyloctatetraene 159 (1989) 263
- Ittah, V., see D. Huppert 159 (1989) 267
- Ivri, J., see R. Reisfeld 160 (1989) 43
- Iwata, K. and H. Hamaguchi, Temperature-dependent microsecond decay dynamics of photogenerated charged solitons in trans-polyacetylene 157 (1989) 300
- Iyer, N.B., see A.V. Deshpande 157 (1989) 239
- Izmailov, I.A., see V.A. Kochelap 157 (1989) 67

- Jackson, W.M., see H. Lin 152 (1988) 477
- Jackson, W.M., see R.S. Urdahl 152 (1988) 485
- Jackson, W.M., see A. Paul 153 (1988) 121
- Jacobs, A., see B. Atakan 154 (1989) 449; 155 (1989) 609
- Jacobs, A., M. Wahl, R. Weller and J. Wolfrum, Absolute reactive cross section and OH product state distribution for the reaction  $\text{H}(1.86 \text{ eV}) + \text{CO}_2 \rightarrow \text{OH} + \text{CO}$  158 (1989) 161
- Jacobsen, S.M., H.U. Güdel and C.A. Daul, Zeeman effects in the NIR luminescence of  $\text{Ti}^{2+}$ -doped  $\text{MgCl}_2$  158 (1989) 77
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- Jakusek, E., H. Kołodziej and S. Sorriso, Dielectric relaxation of the diaryl ketones 153 (1988) 341
- Jalkanen, K.J., see P.J. Stephens 156 (1989) 509
- Jamieson, M.J., Coupled Hartree-Fock calculation of the Cotton-Mouton constant and hyperpolarizability of helium 154 (1989) 521
- Janes, R., see M.C.R. Symons 160 (1989) 386
- Jansen, G. and B.A. Hess, Relativistic all-electron configuration interaction calculations on the gold atom 160 (1989) 507
- Janssen, M.H.M., see D.W. Chandler 156 (1989) 151
- Jarrold, M.F., see U. Ray 159 (1989) 221
- Jarvie, T.P., K. Takegoshi, D. Suter, A. Pines and D.B. Zax, Suppression of the zero frequency peak in zero field NMR 158 (1989) 325
- Jasinski, J.M., see M.H. Begemann 155 (1989) 351
- Jasinski, J.M., see J.O. Chu 155 (1989) 576
- Jaworska-Augustyniak, A., see A. Maciejewski 153 (1988) 227
- Jeffries, J.B., K. Kohse-Höinghaus, G.P. Smith, R.A. Copeland and D.R. Crosley, Rotational-level-dependent quenching of  $\text{OH}(A^2\Sigma^+)$  at flame temperatures 152 (1988) 160
- Jeng, D.C., see F.E. Budenholzer 156 (1989) 411
- Jensen, H.J.Aa., see H. Ågren 153 (1988) 322
- Jensen, H.J.Aa., see J. Olsen 154 (1989) 380
- Jent, F. and H. Paul, Electron spin polarization of free radicals induced by electron-nuclear cross relaxation 160 (1989) 632
- Jesse, K., F.J. Comes, R. Schmidt and H.-D. Brauer, Activation parameters for the photocycloreversion of heterocoerdianthrone endoperoxide in the condensed phase 160 (1989) 8
- Jesudason, M.V., see N. Boden 152 (1988) 94; 154 (1989) 613
- Jiang, Y., H. Zhu, H. Zhang and I. Gutman, Moment expansion of Hückel molecular energies 159 (1989) 159
- Joachim, C., see P. Sautet 153 (1988) 511
- Joentgen, W., see K.M.T. Yamada 160 (1989) 113
- Johansen, H., Analysis of the spin density for an excited triplet state of the permanganate ion 156 (1989) 592
- Johns, J.W.C., see N. Moazzen-Ahmadi 151 (1988) 318
- Johnson, C.K., see I.-J. Lee 156 (1989) 227
- Johnson, D.G., see U. Hofstra 151 (1988) 169
- Johnson, K.H., see Y. Takai 159 (1989) 376
- Johnson, M.A., see M.J. DeLuca 152 (1988) 67
- Johnson, P.M., see S. Sharpe 155 (1989) 262
- Johnson, S.G. and G.J. Small, Spectral hole burning of a strongly exciton-coupled bacteriochlorophyll *a* antenna complex 155 (1989) 371

- Johnston, E.A., see H. Lin 152 (1988) 477
- Jolicard, G., see G.D. Billing 155 (1989) 521
- Jolly, J., see G. Baravian 159 (1989) 361
- Jones, H., see U. Magg 151 (1988) 263, 503
- Jones, H., see R.-D. Urban 154 (1989) 135; 158 (1989) 443
- Jones, H., see A.H. Bahnmaier 155 (1989) 269
- Jones, J., see R.E. Ballard 151 (1988) 477
- Jones, R.G., see N.K. Singh 155 (1989) 463
- Jones, W.J., see A. Balakrishnan 155 (1989) 43
- Jongenelis, A.P.J.M. and J. Schmidt, Triplet exciton zero-field ODMR on 1,4-dibromobenzene 152 (1988) 497
- Jonsen, P., see K.D.M. Harris 154 (1989) 593
- Jordan, K.D., see Y. Choi 156 (1989) 450
- Jørgensen, C.K., Ligand field of noble gases and closed-shell molecules coordinated to chromium(0) pentacarbonyl 153 (1988) 185
- Jørgensen, P., see J. Olsen 154 (1989) 380
- Jortner, J., see M.E. Michel-Beyerle 151 (1988) 188
- Jortner, J., U. Landman and R.N. Barnett, Optical absorption spectra of  $(\text{H}_2\text{O})_n$  clusters 152 (1988) 353
- Jortner, J., see U. Even 156 (1989) 138
- Jortner, J., see M. Bixon 159 (1989) 17
- Joseph, J., see I.R. Politzer 159 (1989) 258
- Joshi, G.C., see N. Periasamy 160 (1989) 457
- Joslin, C.G. and C.G. Gray, Far-infrared absorption in liquid carbon tetrachloride: a theoretical study of the lineshape and intensity 154 (1989) 369
- Jouvet, C., C. Lardeux-Dedonder and D. Solgadi, Fluorescence excitation spectra of the  $\text{XeCl}(\text{B}, \text{C})$  states in a supersonic jet 156 (1989) 569
- Jovanić, B., see V. Urošević 155 (1989) 325
- Jovanic, B.R., V.V. Urošević, Lj.D. Zekovic and B. Radenkovic, Bond lengths between aluminium and different complex ions 158 (1989) 172
- Justus, B.L., C.D. Merritt and A.J. Campillo, Efficient photogeneration of triplets in shock-compressed 2,4-dinitrostilbene 156 (1989) 64
- Justus, B.L., see C.D. Merritt 159 (1989) 349

Kaetsu, H., see S. Arai	151 (1988) 516
Kahn, O., see D. Gatteschi	160 (1989) 157
Kaiser, W., see F. Laermer	156 (1989) 381
Kaiser, W., see W. Holzapfel	160 (1989) 1
Kakou, R., see P. Roubin	160 (1989) 345
Kalonji, G., see Y. Takai	159 (1989) 376
Kalpouzos, C., D. McMorro, W.T. Lotshaw and G.A. Kenney-Wallace, Femtosecond laser-induced optical Kerr dynamics in CS <sub>2</sub> /alkane binary solutions	155 (1989) 240
Kalyanasundaram, K. and Md.K. Nazeeruddin, Photophysical and redox properties of mono- and bi-nuclear complexes of osmium(II) with 2,3-bis(2-pyridyl)pyrazine as bridging ligand	158 (1989) 45
Kamat, P.V., T.W. Ebbesen, N.M. Dimitrijević and A.J. Nozik, Primary photochemical events in CdS semiconductor colloids as probed by picosecond laser flash photolysis	157 (1989) 384
Kamisuki, T., see S. Matsunuma	154 (1989) 555
Kanamori, H., see Y. Endo	160 (1989) 280
Kändler, J., T. Martell and W.E. Ernst, Electric dipole moments and hyperfine structure of SrF A <sup>2</sup> Π and B <sup>2</sup> Σ <sup>+</sup>	155 (1989) 470
Kanhere, D.G., A. Kshirsagar and V. Bhamre, Two-component density functional theory of positron binding to negative ions	160 (1989) 526
Kanno, H., see S. Yamauchi	151 (1988) 315; 154 (1989) 248
Kappert, J., see A. Geers	155 (1989) 614
Kapral, R., see E.A. Carter	156 (1989) 472
Kaptein, R., see A.V. Podoplelov	160 (1989) 233
Karatsu, T., see T. Arai	158 (1989) 429
Karna, S.P., see B. Engels	152 (1988) 397
Karolczak, J., see J.R. Dunlop	151 (1988) 362; 154 (1989) 613
Karolczak, J., see A. Maciejewski	153 (1988) 227
Karpiuk, J. and Z.R. Grabowski, Mechanism and kinetics of fluorescence quenching of aromatic hydrocarbons by a stable nitroxyl radical	160 (1989) 451
Kasatani, K., see H. Sato	151 (1988) 97
Kasatani, K., see T. Matsushima	157 (1989) 55
Kasha, M., see J.M. MacInnis	151 (1988) 375
Kasha, M., see D. Gormin	153 (1988) 574
Kashiwagi, H., see M. Saito	155 (1989) 557
Kassab, E., J. Fouquet and E.M. Evleth, Some theoretically based speculations on the structure of ammoniated NH <sub>4</sub> <sup>+</sup>	153 (1988) 522
Kasuya, T., see K. Tsukiyama	152 (1988) 523
Kasuya, T., see T. Munakata	154 (1989) 604
Kato, M., S. Yamauchi and N. Hirota, A well resolved phosphorescence spectrum of [Ru(bpy) <sub>3</sub> ] <sup>2+</sup> in a diluted system	157 (1989) 543
Katsuki, S. and S. Huzinaga, An effective Hamiltonian method for valence-electron molecular calculations	152 (1988) 203
Kawabata, Y., see T. Nakanaga	160 (1989) 129
Kawabe, Y., see H. Ikeda	157 (1989) 576
Kawai, R., see I.L. Garzón	158 (1989) 525
Kawano, H., see Y. Hidaka	154 (1989) 573
Kawasaki, K., see H. Ikeda	157 (1989) 576

- Kawasaki, M., see Y. Matsumi 155 (1989) 486
- Kawasaki, M., see T. Matsushima 157 (1989) 55
- Kawasaki, M., see T. Ibuki 160 (1989) 152
- Kaya, K., see S. Nonose 158 (1989) 152
- Kaziska, A.J., see S.A. Wittmeyer 151 (1988) 384; 154 (1989) 1
- Kaziska, A.J., S.A. Wittmeyer, A.L. Motyka and M.R. Topp, Mode- and complexation-specific singlet-triplet coupling in jet-cooled perylene studied by time-resolved fluorescence spectroscopy 154 (1989) 199
- Kellö, V., J. Noga, G.H.F. Dierksen and A.J. Sadlej, A study of the performance of high-level correlated methods: the energy, dipole moment, and polarizability functions of CO 152 (1988) 387
- Kelly, P.B. and S.G. Westre, Resonance Raman spectroscopy of the methyl radical 151 (1988) 253
- Kemnitz, K., Diffusionless homogeneous electron transfer. Determination of the through-space electron-exchange matrix element of aromatic donor-acceptor pairs 152 (1988) 305
- Kemp, T.J., see H.B. Ambroz 160 (1989) 396
- Kendrick, J., see N.A. Burton 155 (1989) 195
- Kenner, R.D., S. Pfannenbergl and F. Stuhl, Collisional quenching of  $\text{PH}(\text{A}^3\Pi, \nu=0)$  at 296 and 415 K 156 (1989) 305
- Kenney-Wallace, G.A., see C. Kalpouzou 155 (1989) 240
- Kerbe, F., see J. Haase 156 (1989) 328
- Kern, J., H. Schwahn and B. Schramm, Nuclear spin state relaxation in formaldehyde 154 (1989) 292
- Ketterle, W., see A. Dodhy 151 (1988) 133
- Ketterle, W., The bending vibration of  $n=3$  states of  $\text{H}_3$  160 (1989) 139
- Khanra, B.C., Muon Knight shifts in the  $\text{LaNi}_5\text{H}_x$  system: a theoretical analysis 157 (1989) 333
- Khetrapal, C.L., see P. Diehl 159 (1989) 199, 318
- Khmelenko, V.V., see E.B. Gordon 155 (1989) 301
- Kieckhäfer, J., H. Knöckel and E. Tiemann, Laser spectroscopy on the  $\text{A}0^+-\text{X}^1\Sigma^+$  transition of TII 160 (1989) 570
- Kiefer, J.H., S.S. Sidhu, S.S. Kumaran and E.A. Irdam, RRKM model of  $\text{C}_2\text{H}_4$  dissociation: heat of formation of vinylidene 159 (1989) 32
- Kikuchi, N., see S. Nonose 158 (1989) 152
- Kikuma, J., see H. Umemoto 153 (1988) 233
- Kim, K.C. and R.N. Mulford, The combination bands ( $\nu_1 + \nu_3$ ,  $\nu_2 + \nu_3$ ) and overtone band ( $3\nu_3$ ) of neptunium hexafluoride 159 (1989) 327
- Kim, K.S., On effective methods to treat solvent effects in macromolecular mechanics and simulations 156 (1989) 261
- Kim, S.K., S.H. Courtney and G.R. Fleming, Isomerization of *t*-stilbene in alcohols 159 (1989) 543
- Kim, Y.S., P.T. Leung and T.F. George, Remark on the morphology-dependent resonance in the decay rate spectrum for molecules near a spherical surface 152 (1988) 453
- Kimura, K., see K. Nakagawa 155 (1989) 278
- Kimura, K., see A.L. Verma 159 (1989) 189
- Kimura, M., see M. Inokuti 152 (1988) 504
- Kinnunen, P.K.J., see M. Yliperttula 152 (1988) 61
- Kinugawa, T., see Y. Matsumi 155 (1989) 486
- Kirby, K., see D.L. Cooper 152 (1988) 393; 155 (1989) 624
- Kirmaier, C., E.J. Bylina, D.C. Youvan and D. Holten, Subpicosecond formation of the intradimer charge transfer state  $[\text{BChl}_{\text{L}}^+\text{BPh}_{\text{M}}^-]$  in reaction centers from the  $\text{His}^{\text{M200}} \rightarrow \text{Leu}$  mutant of *Rhodobacter capsulatus* 159 (1989) 251



- Kirstein, S., H. Möhwald and M. Shimomura, Crystalline two-dimensional domains of cyanine dyes at interfaces 154 (1989) 303
- Kirtman, B. and M. Hasan, Ab initio longitudinal polarizabilities and hyperpolarizabilities of polydiacetylene and polybutatriene oligomers 157 (1989) 123
- Kisiel, Z., see A.S. Georgiou 155 (1989) 447
- Kispert, L.D., see L.S. Prasad 151 (1988) 443
- Kita, S., see H. Tanuma 159 (1989) 442
- Kitagawa, T., see A.L. Verma 159 (1989) 189
- Kitamura, N., see S. Imabayashi 153 (1988) 23
- Kitsopoulos, T.N., I.M. Waller, J.G. Loeser and D.M. Neumark, High resolution threshold photodetachment spectroscopy of negative ions 159 (1989) 300
- Kjær, A.M., N.J. Kjær, J. Ulstrup and M.G. Zakaraya, Bandshape parameter dependence on temperature and solvent dynamics in absorption spectra and Raman excitation profiles of beta-carotene 157 (1989) 447
- Kjær, N.J., see A.M. Kjær 157 (1989) 447
- Kleiber, P.D., see G. Pichler 156 (1989) 467
- Klein, M.L., see S. Yashonath 153 (1988) 551
- Klein, U.K.A., see A. Suwaiyan 159 (1989) 244
- Kleindienst, H. and A. Müller, Nonadiabatic lower bound calculations on  $\text{HD}^+$ ,  $\text{DT}^+$  and  $\text{HT}^+$  157 (1989) 426
- Kleyn, A.W., see T.C.M. Horn 156 (1989) 623
- Kleyn, A.W., see M.E.M. Spruit 159 (1989) 342
- Kliger, D.S., see R.A. Goldbeck 156 (1989) 545
- Klimcak, C.M., see N.D. Bhaskar 154 (1989) 175
- Klimov, A.N., see K.N. El'tsov 158 (1989) 271
- Kliner, D.A.V., see R.S. Blake 153 (1988) 365
- Kliner, D.A.V., see K.-D. Rinnen 153 (1988) 371
- Klinger, D.J., Shape of the binodal curves at a critical endpoint, Chem. Phys. Letters 145 (1988) 219. Erratum 157 (1989) 378
- Klinowski, J., see P.P. Man 151 (1988) 143
- Klinowski, J., see H. Hamdan 158 (1989) 447
- Klopovsky, K.S., see Yu.N. Zhuk 153 (1988) 181
- Knochenmuss, R., see T. Troxler 159 (1989) 554
- Knöckel, H., see J. Kieckhäfer 160 (1989) 570
- Knoll, W., see V. Mizrahi 156 (1989) 392
- Knowles, P.F., see N. Boden 152 (1988) 94; 154 (1989) 613
- Knowles, P.J., Very large full configuration interaction calculations 155 (1989) 513
- Kobara, K., see M. Tsuji 155 (1989) 481; 158 (1989) 470
- Kobashi, H., M. Funabashi, H. Shizuka, T. Okada and N. Mataga, Ion-pair formation competing with internal conversion from the second excited state in the chloranil-diphenylamine complex 160 (1989) 261
- Koch, E.-E., see M.L.M. Rocco 160 (1989) 366
- Koch, F., see M. Creuzburg 156 (1989) 387
- Kochanski, E., see L. Kurdi 158 (1989) 111
- Kochanski, E., Temperature effects on Monte Carlo studies of small  $\text{Ca}^+(\text{H}_2\text{O})_n$  clusters 159 (1989) 51
- Kochelap, V.A., I.A. Izmailov and L.Yu. Mel'nikov, The possibility of population inversion and light gain due to electronic energy transfer from  $\text{N}_2(\text{A}^3\Sigma_u^+)$  157 (1989) 67

- Kock, R., see K.M.T. Yamada 160 (1989) 113
- Kocot, A. and K. Pasterny, Application of an autoregressive model for the analysis of reorientational motion in polar liquids 156 (1989) 351
- Kocot, A., see K. Pasterny 156 (1989) 550
- Koga, T., see L. Salem 160 (1989) 67
- Köhler, W., see R. Hirschmann 151 (1988) 60
- Kohse-Höinghaus, K., see J.B. Jeffries 152 (1988) 160
- Kolbert, A.C., see A. Bielecki 155 (1989) 341
- Kollin, E.B., see J.L. Gland 151 (1988) 227
- Kołodziej, H., see E. Jakusek 153 (1988) 341
- Komornicki, A., see J. Breidung 153 (1988) 76
- Konami, H., M. Hatano and A. Tajiri, An analysis of paramagnetic shifts in proton NMR spectra of non-radical lanthanide(III)-phthalocyanine sandwich complexes 160 (1989) 163
- Kondow, T., see A. Nakajima 151 (1988) 511
- Konovalov, V.V., A.M. Raitsimring, Yu.D. Tsvetkov and I.I. Bilkis, Photoelectrochemical study of the radical anion cleavage rates in aromatic molecules: halobenzoic acids 157 (1989) 257
- Konrat, R. and H. Sterk, Effect of internal rotation on angular correlation functions of asymmetric tops 159 (1989) 137
- Konuk, R., see C. Böhne 152 (1988) 156
- Kopelman, R., see J. Prasad 157 (1989) 535
- Köppel, H., see E. Ohrendorf 151 (1988) 273
- Kori, M., see B. Halpern 159 (1989) 605
- Kornweitz, H., see A. Persky 159 (1989) 134
- Kosloff, R., see Z. Kotler 153 (1988) 483
- Kosloff, R., see B. Hartke 158 (1989) 238
- Kosower, E.M., see D. Huppert 159 (1989) 267
- Koszykowski, M.L., see D.W. Noid 154 (1989) 391
- Kotagiri, Y., M. Fujita, T. Hikida and Y. Mori, The triplet state of ammonia 158 (1989) 440
- Kothe, G., see J. Fessmann 152 (1988) 491
- Kotler, Z., A. Nitzan and R. Kosloff, Multiconfiguration time-dependent self-consistent field approximation for curve crossing in presence of a bath. A fast Fourier transform study 153 (1988) 483
- Kotzian, M., N. Rösch, R.M. Pitzer and M.C. Zerner, A spin-orbit interaction enhanced INDO/S-CI technique: applications to main group and transition metal heteronuclear diatomic molecules 160 (1989) 168
- Kouri, D.J., see M. Zhao 156 (1989) 281
- Kouri, D.J., see C. Yu 157 (1989) 491
- Kovacs, H., J. Kowalewski and A. Maliniak, Nitrogen-14 relaxation for acetonitrile in water-1-propanol mixtures: the role of dielectric friction 152 (1988) 427
- Kowalewski, J., see H. Kovacs 152 (1988) 427
- Kowari, K., see M. Inokuti 152 (1988) 504
- Kownacki, K., see P. Myslinski 155 (1989) 256
- Koyama, Y., see H. Hashimoto 152 (1988) 319; 154 (1989) 321
- Koyanagi, M., H. Futami, M. Mukai and S. Yamauchi, Direct evidence of photochemical  $\alpha$ -cleavage of benzoin in fluid solutions 154 (1989) 577
- Koyano, I., see K. Ueda 154 (1989) 357
- Koyano, I., see S. Nagaoka 154 (1989) 363
- Koyano, I., see T. Imajo 160 (1989) 143

- Kozankiewicz, B., Kinetics of the emission in the charge-transfer crystal of pyromellitic dianhydride-phenanthrene 160 (1989) 134
- Krämer, R., see B. Brzezinski 156 (1989) 213; 157 (1989) 512
- Krantzman, K. and D. Farrelly, Evaluation of non-separable bound-bound Franck-Condon factors using the self-consistent field and adiabatic approximations 152 (1988) 196
- Krasnoperov, L.N., see A.I. Chichinin 160 (1989) 448
- Kraus, J.S., see U. Ray 159 (1989) 221
- Krauss, M. and B. Guillot, Dipole moments in rare gas interactions 158 (1989) 142
- Krausz, E., see H. Riesen 151 (1988) 65, 71
- Krausz, E., see L. Dubicki 157 (1989) 315
- Kresin, V.Z. and W.A. Lester Jr., Reaction Hamiltonian method for chemical reactions: effect of indistinguishable nuclei 159 (1989) 297
- Kress, J.D., Z. Bačić, G.A. Parker and R.T. Pack, Quantum effects in the  $F + H_2 \rightarrow HF + H$  reaction. Accurate 3D calculations with a realistic potential energy surface 157 (1989) 484
- Krischer, K., see B. Pettinger 151 (1988) 151
- Krogh-Jespersen, K., see J.T. Blair 154 (1989) 531
- Kroh, J., see A. Plonka 153 (1988) 433
- Krümpelmann, T., see L. Chow Chiu 151 (1988) 220; 157 (1989) 60
- Krygowski, T.M., see S.J. Grabowski 151 (1988) 425
- Kshirsagar, A., see D.G. Kanhere 160 (1989) 526
- Kubozono, Y., see M. Ata 157 (1989) 19
- Kucharski, S.A., see R.J. Bartlett 155 (1989) 133
- Kucharski, S.A. and R.J. Bartlett, Coupled-cluster methods that include connected quadruple excitations,  $T_4$ : CCSDTQ-1 and Q(CCSDT) 158 (1989) 550
- Kuchitsu, K., see A. Nakajima 151 (1988) 511
- Kuchitsu, K., see Y. Ohshima 152 (1988) 116, 294
- Kuczowski, R.L., see M.S. LaBarge 159 (1989) 559
- Kudo, T. and S. Nagase, Jahn-Teller distortions in  $SnH_4^+$  and  $PbH_4^+$  156 (1989) 289
- Kühl, K. and R. Schinke, Time-dependent rotational state distributions in direct photodissociation 158 (1989) 81
- Kühle, H., see I. Gersonde 153 (1988) 273
- Kühn, A., see J. Lotter 157 (1989) 171
- Kühn, H., W. Vogel and D.-G. Welsch, Hot luminescence of molecules in strong laser fields 158 (1989) 233
- Kühnle, W., see H. Staerk 155 (1989) 603
- Kulakov, P.V., see V.P. Bulatov 153 (1988) 258
- Kulakov, P.V., see S.G. Cheskis 155 (1989) 37
- Kulkarni, G.V., see J.K. Burdett 160 (1989) 350
- Kumaran, S.S., see J.H. Kiefer 159 (1989) 32
- Kundu, T., see A. Nag 160 (1989) 257
- Kunkel, W.B., see G.C. Stutzin 155 (1989) 475
- Kunkely, H., see A. Vogler 158 (1989) 74
- Kunz, R.R., see S.M. Gates 154 (1989) 505
- Kupka, H., see T. Ledwig 154 (1989) 309
- Kuppermann, A., see S.A. Cuccaro 154 (1989) 155; 157 (1989) 440
- Kurawaki, J. and Y. Kusumoto, A resonance Raman study of the interaction between chlorophyll and N-methylmyristamide in aqueous surfactant solutions 158 (1989) 495
- Kurdi, L. and E. Kochanski, Theoretical studies of sulfuric acid monohydrate: neutral or ionic complex? 158 (1989) 111

*Master index to volumes 151-160*

Kurematsu, Y., see K. Tsukiyama	152 (1988) 523
Kuroda, T., see N. Ikeda	156 (1989) 204
Kushawaha, V. and A. Michael, Collisional studies involving low energy helium ions and mercury bromide	154 (1989) 599
Kusumoto, T., see K. Shibuya	152 (1988) 129
Kusumoto, Y., see J. Kurawaki	158 (1989) 495
Kusunoki, I., see H. Tanuma	159 (1989) 442
Kuwata, K., see Y. Sueishi	151 (1988) 439; 160 (1989) 640
Kuze, H., J. Häger and H. Walther, Influence of scattering history and out-of-plane scattering on the rotational energy redistribution: NO scattered from graphite	153 (1988) 569
Kuzmin, V.A., see P.P. Levin	152 (1988) 409
Kwiatkowski, J.S., see M.J. Nowak	157 (1989) 14

- Laaksonen, L., see F. Müller-Plathe 160 (1989) 175
- LaBarge, M.S., J.-J. Oh, K.W. Hillig II and R.L. Kuczkowski, The benzene-SO<sub>2</sub> and pyridine-SO<sub>2</sub> complexes 159 (1989) 559
- Lablanquie, P., see K. Ito 151 (1988) 121
- Ladanyi, B.M., see L.C. Geiger 159 (1989) 413
- Ladd, J.A., see M. Ilczyszyn 153 (1988) 385
- Ladik, J., see M. Vračko 153 (1988) 166
- Ladik, J., see P. Saalfrank 153 (1988) 451
- Ladik, J., see M.A. Abdel-Raouf 156 (1989) 296
- Laermer, F., T. Elsaesser and W. Kaiser, Ultrashort vibronic and thermal relaxation of dye molecules after femtosecond ultraviolet excitation 156 (1989) 381
- LaFemina, J.P., Photoconduction in polyimide 159 (1989) 307
- Lafferty, W.J., see B.A. Wofford 152 (1988) 299
- Laganà, A., see V. Aquilanti 158 (1989) 87
- Laganà, A., see M. Baer 158 (1989) 362
- Lagutin, B.M., V.L. Sukhorukov and V.F. Demekhin, Electron rearrangement in inner-shell spectra of 3d-metal ion compounds 160 (1989) 432
- Lain, L., see C. Valdemoro 152 (1988) 118
- Lamont, C.L.A., see B.E. Hayden 160 (1989) 331
- Landman, U., see J. Jortner 152 (1988) 353
- Laneman, S., see Y.J. Chang 156 (1989) 421
- Langhoff, P.W., see C.L. Winstead 151 (1988) 417
- Langhoff, P.W., see K.T. Leung 157 (1989) 135
- Langhoff, S.R., see C.W. Bauschlicher Jr. 151 (1988) 391; 158 (1989) 245, 409
- Lapinski, L., see M.J. Nowak 157 (1989) 14
- Lapouyade, R., see C. Eckert 153 (1988) 357
- Lardeux-Dedonder, C., see C. Jouvet 156 (1989) 569
- Largo-Cabrerizo, A. and C. Barrientos, Theoretical studies of potential astrophysical molecules. The CICC and SC<sub>2</sub>H radicals 155 (1989) 550
- Larsson, S., Localization condition for metallic conductivity and superconductivity 157 (1989) 403
- Lau, A.M.F., Field statistical effects on Autler-Townes spectroscopy of molecules using phase-diffusion lasers 151 (1988) 116
- Lau, A.M.F. and W.M. Huo, Molecular transition moment determination by Autler-Townes spectroscopy: D<sup>1</sup>Π<sub>u</sub>-E<sup>1</sup>Σ<sub>g</sub><sup>+</sup> bands of H<sub>2</sub> 157 (1989) 108
- Laubereau, A., see A. Mokhtari 155 (1989) 593
- Laubereau, A., see G. Angel 156 (1989) 169
- Laucagne, J.J., see P. Monchicourt 152 (1988) 336
- Laucagne, J.J., see P. Pradel 158 (1989) 412
- Launay, J.-P., M. Sowinska, L. Leydier, A. Gourdon, E. Amouyal, M.-L. Boillot, F. Heisel and J.A. Miehe, Towards molecular switching: photophysical properties of N,N'-bis (4-cyanophenyl)piperazine. A bridging TICT molecule 160 (1989) 89
- Launay, J.M., see B. Lepetit 151 (1988) 287
- Lawler, R.G., see D.M. Bartels 152 (1988) 109
- Layton, E., see S.-I. Chu 157 (1989) 151
- Lazzeretti, P., see P.J. Stephens 156 (1989) 509
- Lazzeretti, P., Rototranslational sum rules for geometrical derivatives of expectation values 160 (1989) 49
- Leach, D.H., see W.P. Acker 155 (1989) 491

- Lech, J. and A. Ślęzak, Aragonite→calcite transformation studied by EPR of  $Mn^{2+}$  ions 157 (1989) 175
- Leclercq, J.M., see M. Foucraut 156 (1989) 599
- Le Duff, Y., see C. Maños 154 (1989) 563
- Ledwig, T., H. Kupka and H.-H. Perkampus, On the mechanism of triplet-singlet relaxation in phenanthrene 154 (1989) 309
- Lee, C., see E.S. Smotkin 152 (1988) 265
- Lee, C.J., Dynamics of interaction of a spin with a radiation field: a consistent full-quantum mechanical treatment 155 (1989) 399
- Lee, I.-J., J.K. Gillie and C.K. Johnson, Photochemical hole burning in bacteriorhodopsin 156 (1989) 227
- Lee, L.C., see D.P. Wang 152 (1988) 513
- Lee, M. and R.M. Hochstrasser, Excited-state photophysics and barrier crossing dynamics of 9,9'-bifluorene 153 (1988) 1
- Lee, S.-L. and I. Gutman, Topological analysis of the eigenvectors of the adjacency matrices in graph theory: degenerate case 157 (1989) 229
- Lee, S.-Y. and R.A. Mathies, Polarizability theory and sum rules 151 (1988) 9
- Lee, S.-Y., W.T. Pollard and R.A. Mathies, Quantum theory for transition state absorption 160 (1989) 531
- Lee, Y.-P., see B.-M. Cheng 151 (1988) 109
- Lee, Y.-P., see J.F. Ogilvie 159 (1989) 239
- Lee, Y.T., see L. Wang 158 (1989) 297
- Leforestier, C., see J.-P. Brunet 153 (1988) 425
- Lefour, J.-M., see L. Salem 160 (1989) 67
- Legon, A.C., see A.P. Cox 153 (1988) 253
- Legon, A.C. and C.A. Rego, H,  $^{19}F$  nuclear-spin-nuclear-spin coupling in the rotational spectrum of  $(CH_3)_3^{15}N...HF$  and the lengthening of the HF bond 154 (1989) 468
- Legon, A.C., see A.S. Georgiou 155 (1989) 447
- Legon, A.C. and A.P. Suckley, Pulsed-jet, diode-laser IR spectroscopy of the  $\nu=1-0$  transition in the  $CO_2$  asymmetric stretching mode of  $(CO_2, HCN)$  157 (1989) 5
- Legon, A.C. and C.A. Rego,  $^{14}N$ - and  $D$ -nuclear quadrupole coupling in the rotational spectrum of  $(CH_3)_3^{14}N...H(D)F$ : modification of the electric field gradients at the  $N$  and  $D$  nuclei 157 (1989) 243
- Legrand, J., see J. Gadhi 156 (1989) 401
- Lehmann, G., see K. Eftaxias 160 (1989) 36
- Leibl, W., see H.-W. Trissl 158 (1989) 515
- Leiva, E. and W. Schmickler, A model for the adsorption of a monolayer of a metal on a foreign metal substrate 160 (1989) 75
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- Lemaire, J.L., see N. Shafizadeh 152 (1988) 75
- Lemaire, J.L., see R.G. Briggs 156 (1989) 363
- Lemmetyinen, H., see M. Yliperttula 152 (1988) 61
- Lemoine, D., see G.C. Corey 160 (1989) 324
- Le Nadan, A., G. Sinou and F. Tuffin, An investigation of the kinetic energy of the ions produced by interaction of helium and neon metastables with carbon monoxide 156 (1989) 24
- Leone, S.R., see L.M. Cousins 155 (1989) 162



- Lepetit, B. and J.M. Launay, A quantum-mechanical study of the reaction  $H + HF(vjm_j) \rightarrow HF(v'j'm'_j) + H$ : exact and centrifugal decoupling calculations in hyperspherical coordinates 151 (1988) 287
- Lepetit, M.-B., see B. Oujia 158 (1989) 559
- Lerf, A., see G. Sun 151 (1988) 54
- Leroi, G.E., see Y.-Y.J. Wu 155 (1989) 69
- Le Roy, R.J., see J.C. Shelley 152 (1988) 14
- Lesclaux, R., see G.K. Moortgat 160 (1989) 443
- Le Sech, C., see A. Henriot 158 (1989) 389
- Lessen, D. and P.J. Brucat, On the nature of  $NiAr^+$  152 (1988) 473
- Lessen, D. and P.J. Brucat, Resonant two-photon dissociation of  $Ni_2^+$  160 (1989) 609
- Lester, M.I., see M.T. Berry 153 (1988) 17
- Lester, M.I., see T.A. Stephenson 159 (1989) 549
- Lester Jr., W.A., see V.Z. Kresin 159 (1989) 297
- Leszczynski, J. and M.C. Zerner, Molecular structure and vibrational spectra of dithionite ion by ab initio calculations 159 (1989) 143
- Leung, K.N., see G.C. Stutzin 155 (1989) 475
- Leung, K.T., J.A. Sheehy and P.W. Langhoff, Vibrational averaging effects on the valence-shell electron momentum distributions in  $H_2O$  employing Hartree-Fock-limit wavefunctions 157 (1989) 135
- Leung, K.T., see M.P. Banjavcic 160 (1989) 371
- Leung, P.T., see Y.S. Kim 152 (1988) 453
- Leutwyler, S., see A. Furlan 153 (1988) 291
- Leutwyler, S., see T. Troxler 159 (1989) 554
- Levanon, H., see A. Regev 160 (1989) 401
- Levelt Sengers, J.M.H., see A.H. Harvey 156 (1989) 415
- Levin, P.P., P.F. Pluzhnikov and V.A. Kuzmin, Mechanism of triplet exciplex quenching by molecular oxygen. Singlet-triplet splitting for the charge transfer state 152 (1988) 409
- Levine, A.M., see D.Z. Goodson 151 (1988) 557
- Levine, R.D., see K.R. Wilson 152 (1988) 435
- Levine, R.D., see C. Wittig 153 (1988) 411
- Levine, R.D., see I. Schechter 153 (1988) 527
- Levine, R.D., see I. Oppenheim 155 (1989) 168
- Levine, R.D., see V. Aquilanti 158 (1989) 87
- Levitt, M.H., see A. Bielecki 155 (1989) 341
- Levy, R.M., see J.T. Blair 154 (1989) 531
- Lewis, J.W., see R.A. Goldbeck 156 (1989) 545
- Leydier, L., see J.-P. Launay 160 (1989) 89
- Lezius, M. and T.D. Märk, Direct experimental evidence for the Coulomb explosion of doubly charged argon cluster ions.  $Ar_n^{2+}$  155 (1989) 496
- L'Hermite, J.M., see F.X. Gadéa 151 (1988) 183
- Li, L., R.J. Lipert, J. LoBue, W.A. Chupka and S.D. Colson, Adiabatic dissociation of photoexcited chlorine molecules 151 (1988) 335
- Li, S., D. Moncrieff, J. Zhao and F.B. Brown, Ab initio study including electron correlation of the ground state ( $X^1\Sigma^+$ ) of  $SiS$  151 (1988) 403
- Li, Z. and H.A. Scheraga, Computation of the free energy of liquid water by the Monte Carlo recursion method 154 (1989) 516
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- Lianos, P., see S. Modes 153 (1988) 351
- Lichtin, D.A., see J.E. Pollard 152 (1988) 171
- Liegner, C.-M., On the Auger spectra of  $\text{CH}_3\text{F}$  151 (1988) 83
- Liegner, C.-M., see M. Vračko 153 (1988) 166
- Liem, N.Q., see R. Bini 151 (1988) 236
- Liesner, M., see R. Düren 160 (1989) 602
- Lightfoot, P.D., see J.E. Baggott 154 (1989) 330
- Lim, E.C., see Y.-D. Shin 151 (1988) 308
- Lim, E.C., see P.-N. Wang 159 (1989) 7
- Lim, E.C., see R.J. Locke 160 (1989) 96
- Lim, K.F., see A.R. Whyte 152 (1988) 377
- Limtrakul, J.P., M. Bär and R. Ahlrichs, Effect of small cations on the hydrogen bond between an N-aromatic heterocycle and amine 160 (1989) 479
- Lin, H., E.A. Johnston and W.M. Jackson, Photodissociation dynamics of  $\text{C}_2\text{N}_2$  at 206.1 nm 152 (1988) 477
- Lin, S.H. and B. Fain, Application of the theory of two-dimensional spectroscopy to the real-time femtosecond transition state spectroscopy 155 (1989) 216
- Lin, S.H., see B. Fain 157 (1989) 233
- Lin, Y., see N.S. Sullivan 156 (1989) 218
- Lindgren, M., see L. Sjöqvist 156 (1989) 323
- Lindsay, B.G., see C.W. Walter 154 (1989) 409
- Lipert, R.J., see L. Li 151 (1988) 335
- Lippitsch, M.E., see S. Draxler 159 (1989) 231
- Lippmaa, E., see J. Haase 152 (1988) 254; 156 (1989) 328
- Littau, K.A., Y.S. Bai and M.D. Fayer, Time evolution of non-photochemical hole burning linewidths: observation of spectral diffusion at long times 159 (1989) 1
- Liu, F., see P. Zhang 153 (1988) 215
- Liu, W.-K., see E. Altendorf 153 (1988) 176
- Liu, X., see X. Wang 157 (1989) 87
- Lledós, A., see J.L. Andrés 153 (1988) 82
- Llor, A. and J. Virlet, Towards high-resolution NMR of more nuclei in solids: sample spinning with time-dependent spinner axis angle 152 (1988) 248
- Lloyd, C., see R.L. Blakley 157 (1989) 398
- Lluch, J.M., see E. Bosch 160 (1989) 543
- LoBue, J., see L. Li 151 (1988) 335
- Locke, R.J. and E.C. Lim, Triplet excimers: further verification by emission measurements 160 (1989) 96
- Loeser, J.G., see T.N. Kitsopoulos 159 (1989) 300
- Long, F.H., H. Lu and K.B. Eisenthal, Femtosecond studies of electron-cation dynamics in neat water: the effects of isotope substitution 160 (1989) 464
- Long, X.P., see I.L. Garzón 158 (1989) 525
- López, V. and V. Fairén, Artificial intelligence and the competitiveness of perturbative approaches 160 (1989) 502
- Lorents, D.C., see Y.K. Bae 159 (1989) 214
- Loring, R.F., see A.M. Walsh 160 (1989) 299

Loschek, R. and D. Möbius, Metallation of porphyrins in lipid monolayers at the air/water interface	151 (1988) 176
Lotshaw, W.T., see C. Kalpouzos	155 (1989) 240
Lotter, J., A. Kühn and E. Illenberger, Formation of $CF_4^-$ from $CF_4$ clusters	157 (1989) 171
Loungnot, D.J., see J.P. Fouassier	160 (1989) 335
Lous, E.J., see R. Vreeker	158 (1989) 24
Love, S.P. and A.J. Sievers, Persistent infrared spectral hole burning of the sulfur-hydrogen vibrational mode in hydrogenated $As_2S_3$ glass	153 (1988) 379
Lowry, R., see S.A. Campbell	155 (1989) 89
Lozovsky, V.A., see A.A. Ioffe	156 (1989) 425
Lozovsky, V.A., see V.P. Bulatov	159 (1989) 171
Lu, H., see F.H. Long	160 (1989) 464
Lu, T.X., see X.Z. Zhao	159 (1989) 37
Luck, W.A.P., see G. Heinje	152 (1988) 358
Luckhaus, D., see A. Amrein	152 (1988) 275
Ludwig, P.K., see J. Notholt	154 (1989) 101
Lukovits, I., A simplified normal coordinate analysis of the vibrations of adsorbed molecules	155 (1989) 297
Luňák Jr., S., see M. Nepraš	159 (1989) 366
Lund, A., see L. Sjöqvist	156 (1989) 323
Lundberg, H., see H. Bergström	155 (1989) 27
Lunine, J.I., see P. Vujkovic Cvijin	159 (1989) 331
Luo, H., see A. Malliaris	155 (1989) 587
Lupi, S., see P. Calvani	157 (1989) 11
Luque, F.J., see M. Orozco	160 (1989) 305
Lutz, H.-P., H. Bitto and J.R. Huber, Single vibronic level decays of triplet states in a supersonic jet	155 (1989) 251
Lykke, K.R., see D.D. Nelson Jr.	153 (1988) 105
Lymarev, A.A., see E.L. Frankevich	159 (1989) 113
Lynch, L.E., see S.R. Flom	154 (1989) 193
Lynden-Bell, R.M., see P.-O. Westlund	154 (1989) 67
Lyyra, A.M., see G. Pichler	156 (1989) 467

- Ma, P., see S. Arai 151 (1988) 516
- Ma, Z., R. Huang and C. Zhang, Multi-quantum transfer vibrational relaxation in supersonic jets of  $I_2(B, v' = 43)$  seeded in Ar,  $N_2$  and CO 154 (1989) 9
- MacDonald, B.D., see T. Uzer 152 (1988) 405
- MacDonald, M.A., see P.A. Hatherly 159 (1989) 355
- Maciejewski, A., A. Jaworska-Augustyniak, Z. Szeluga, J. Wojtczak and J. Karolczak, Determination of ferrocene triplet lifetime by measuring  $T_1 \rightarrow T_1$  energy transfer to phenyllosazone-D-glucose 153 (1988) 227
- MacInnis, J.M. and M. Kasha, The role of the anionic potential in excited-state proton transfer in lumichrome picosecond spectroscopy 151 (1988) 375
- Mack, H.-G. and H. Oberhammer, An ab initio study of the geometries and relative stabilities of isocyanates and cyanates 157 (1989) 436
- Mackie, A.R., see P.J. Atkinson 151 (1988) 494
- MacLagan, R.G.A.R., see J.A. Harrison 155 (1989) 419
- MacPhail, R.A., see D.B. Chesnut 151 (1988) 415
- Madonia, F., see P.L. San Biagio 154 (1989) 477
- Magerl, A., see R.C.T. Slade 155 (1989) 305
- Magg, U., H. Birk and H. Jones, The ground-state infrared spectrum of strontium monohydride (SrH) 151 (1988) 263
- Magg, U., H. Birk and H. Jones, The ground-state infrared spectrum of  $^{85}\text{RbH}$  and  $^{87}\text{RbH}$  151 (1988) 503
- Magg, U., see R.-D. Urban 154 (1989) 135; 158 (1989) 443
- Magnasco, V., C. Costa and G. Figari, Long-range second-order interactions and the shape of the He-HF and Ne-HF complexes 156 (1989) 585
- Magnasco, V., C. Costa and G. Figari, On the angular shape of van der Waals dimers of small polar molecules 160 (1989) 469
- Magraw, J.E., see S.F.J. Cox 160 (1989) 85
- Mague, J.T., see R.L. Blakley 157 (1989) 398
- Mahajan, C.G., see A. Balakrishnan 155 (1989) 43
- Maier, G., see F. Stroh 160 (1989) 105
- Maïnos, C., Y. Le Duff, M.C. Castex and E. Boursey, Pressure effects in multiple resonant multiphoton transitions 154 (1989) 563
- Majenz, W., see W. Rettig 154 (1989) 335
- Majitov, M.I., see Yu.A. Serebrennikov 157 (1989) 462
- Maki, A.H., see B.D. Schlyer 154 (1989) 39
- Makino, M., see K. Yoshikawa 160 (1989) 623
- Makri, N. and W.H. Miller, Correct short time propagator for Feynman path integration by power series expansion in  $\Delta t$  151 (1988) 1
- Makri, N., Effective non-oscillatory propagator for Feynman path integration in real time 159 (1989) 489
- Malatesta, V., see P. Manitto 159 (1989) 310
- Maldivi, P., A.-M. Giroud-Godquin, J.-C. Marchon, D. Guillon and A. Skoulios, Diruthenium(II, II) tetra- $\mu$ -alkylcarboxylates: magnetic susceptibility studies of their electronic configuration and thermotropic liquid crystalline mesophase 157 (1989) 552
- Malicet, J., J. Brion and D. Daumont, Temperature dependence of the absorption cross-section of ozone at 254 nm 158 (1989) 293
- Maliniak, A., see H. Kovacs 152 (1988) 427
- Malkin, V.G., O.V. Gritsenko and G.M. Zhidomirov,  $^{29}\text{Si}$  NMR: a new approach to the analysis of chemical shift variations 152 (1988) 44

- Malliaris, A., N. Boens, H. Luo, M. Van der Auweraer, F.C. De Schryver and S. Reekmans, The micelle-water monomer exchange process in solutions of ionic surfactants measured by transient fluorescence quenching 155 (1989) 587
- Mallouk, T.E., see E.S. Smotkin 152 (1988) 265
- Malmqvist, P.-Å. and B.O. Roos, The CASSCF state interaction method 155 (1989) 189
- Malrieu, J.-P., see B. Oujia 158 (1989) 559
- Man, P.P., J. Klinowski, A. Trokiner, H. Zanni and P. Papon, Selective and non-selective NMR excitation of quadrupolar nuclei in the solid state 151 (1988) 143
- Manitto, P., G. Speranza and V. Malatesta, The quenching of  $^1\text{O}_2(^1\Delta_g)$  by anthracenes in aqueous solution. Evidence for a charge-transfer mechanism 159 (1989) 310
- Manolopoulos, D.E. and R.E. Wyatt, Quantum scattering via the log derivative version of the Kohn variational principle 152 (1988) 23
- Manolopoulos, D.E. and R.E. Wyatt, Calculations relating to the experimental observation of resonances in the  $\text{H}+\text{H}_2$  reaction 159 (1989) 123
- Manz, J., see R.A. Fischer 156 (1989) 100
- Marchon, J.-C., see P. Maldivi 157 (1989) 552
- Marcus, R.A., see V. Engel 152 (1988) 1
- Marcus, R.A., Semiclassical wave packets in the angle representation and their role in molecular dynamics 152 (1988) 8
- Mares, J., see W. Nie 160 (1989) 597
- Marinelli, F. and A. Pellegatti, An ab initio CI determination of the low-lying electronic states of  $\text{B}_3$  158 (1989) 545
- Märk, T.D., see M. Lezius 155 (1989) 496
- Märk, T.D., see G. Walder 157 (1989) 224
- Märk, T.D., see A. Stamatovic 160 (1989) 29
- Markovic, N., G. Nyman and S. Nordholm, Complex formation in  $\text{O}+\text{OH}$  collisions - a two-step mechanism 159 (1989) 435
- Markovitsi, D., see R. Even 156 (1989) 609
- Marks, A.J., J.N. Murrell and A.J. Stace, The influence of molecular rotation on a gas-phase unimolecular isomerisation reaction 154 (1989) 492
- Markus, M.W., see K.M.T. Yamada 160 (1989) 113
- Maroulis, G. and A.J. Thakkar, Hyperpolarizabilities and polarizabilities of neon: discrepancy between theory and experiment 156 (1989) 87
- Marowsky, G., see V.I. Fabelinsky 156 (1989) 159
- Marquardt, R.R., see A.J. Ross 156 (1989) 455
- Marsault-Herail, F., see Y. Garrabos 160 (1989) 250
- Marsden, D.C.J., see R.F. Meads 160 (1989) 342
- Martell, T., see J. Kändler 155 (1989) 470
- Martin, F. and A. Salin, Phase shifts of continuum functions through a discretization method 157 (1989) 146
- Martin, J.M.L., J.P. François and R. Gijbels, On the validity of Pople's infinite-order Möller-Plesset extrapolation and an alternative formula within MBP/CC theories 157 (1989) 217
- Martin, J.M.L., J.P. François and R. Gijbels, On the validity of Pople's infinite-order Möller-Plesset extrapolation and an alternative formula within MBPT-CC theories, Chem. Phys. Letters 157 (1989) 217. Erratum 159 (1989) 122
- Martin, N.A. and B.A. Thrush, The disproportionation of  $\text{DO}_2$  radicals studied by infrared laser spectroscopy 153 (1988) 200
- Martin, N.A., see P.B. Davies 156 (1989) 553
- Martinez, E., P. Puyuelo, F.J. Basterrechea and M.T. Martínez, Radiative lifetime of the  $\text{Te}_2 \text{A}(0_0^+)$  state studied by laser-induced fluorescence 156 (1989) 564

- Martínez, M.T., see E. Martínez 156 (1989) 564
- Martinho Simões, J.A. and D. Griller, Enthalpy of formation of the benzoyl radical by photoacoustic calorimetry 156 (1989) 564
- Martynov, V.V., see K.N. El'tsov 158 (1989) 175
- Maruyama, Y., see K. Awaga 158 (1989) 271
- Marx, R., see J. Lemaire 158 (1989) 556
- Masnou-Seeuws, F., see A. Henriët 152 (1988) 50
- Mason, S.M. and R.P. Tuckett, The  $A^2\Pi_u-X^2\Pi_g$  emission spectrum of  $I_2^+$  158 (1989) 389
- Masson, F., S. Aduru, C.S. Sass and J.W. Rabalais, Scatter-free direct recoil spectra 160 (1989) 575
- Masuhara, H., see N. Ikeda 152 (1988) 325
- Masuhara, H., S. Eura, H. Fukumura and A. Itaya, Laser ablation dynamics of poly(N-vinylcarbazole) film as revealed by time-resolved fluorescence spectroscopy 154 (1989) 207; 156 (1989) 204
- Mataga, N., see N. Ikeda 156 (1989) 446
- Mataga, N., see H. Kobashi 154 (1989) 207
- Mathies, R.A., see S.-Y. Lee 160 (1989) 261
- Mathies, R.A., see P.J. Reid 151 (1988) 9; 160 (1989) 531
- Matsuda, Y., see Y. Takasu 156 (1989) 163
- Matsui, H., see A. Miyoshi 152 (1988) 105
- Matsumi, Y., M. Kawasaki, T. Sato, T. Kinugawa and T. Arikawa, Photodissociation of chlorine molecule in the UV region 160 (1989) 291
- Matsumi, Y., see T. Ibuki 155 (1989) 486
- Matsumoto, M., see T. Nakanaga 160 (1989) 152
- Matsumoto, S., M. Toyama, T. Yasuda, T. Uchide and R. Ueno, Orthogonality constrained calculations of MC SCF excited states in non-adiabatic regions 160 (1989) 129
- Matsumoto, Y., see Y. Ohshima 157 (1989) 142
- Matsumura, C., see K. Sugawara 152 (1988) 116, 294
- Matsumura, C., see T. Nakanaga 157 (1989) 309
- Matsunaga, N., see J.A. Montgomery Jr. 160 (1989) 129
- Matsunuma, S., N. Akamatsu, T. Kamisuki, Y. Adachi and C. Hirose, Resonance CARS spectrum of *p*-aminophenylthiyl radical and Raman spectrum of bis-(*p*-aminophenyl) disulfide 155 (1989) 413
- Matsuo, T., see H. Yonemura 154 (1989) 555
- Matsuoka, O., Comments on the basis spinors in Dirac-Fock-Roothaan calculations 155 (1989) 157
- Matsuoka, O. and S. Okada, Dirac-Fock-Roothaan calculations on the sixth-row elements Tl-Rn 155 (1989) 544
- Matsushima, T., Anisotropic angular distribution of desorption of  $CO_2$  produced on Pd(110) surfaces 155 (1989) 547
- Matsushima, T., Y. Onai, K. Kasatani, M. Kawasaki and H. Sato, Resonance Raman spectra of  $Br_2$  adsorbed on low-temperature solid surfaces: excitation profile extending to the region above the dissociation limit in the gas phase 155 (1989) 313
- Matsuura, H., see K. Ohno 157 (1989) 55
- Matthews, G.P. and A. Townsend, An effective isotropic pair potential energy function for carbon dioxide 155 (1989) 443
- Matti, G.Y., see A.W. Allaf 155 (1989) 518
- Mauersberger, K., see J. Morton 155 (1989) 32
- Mauersberger, K., see S.M. Anderson 154 (1989) 143
- Mayer, I., Some remarks on the polemic about "Direct consequences of the bond index statistical interpretation", Chem. Phys. Letters 156 (1989) 175
- Mayer, I., Some remarks on the polemic about "Direct consequences of the bond index statistical interpretation", Chem. Phys. Letters 151 (1988) 95. Erratum 151 (1988) 570



Maynau, D., see R. Cimiraglia	153 (1988) 507
Mayne, H.R., see J.A. Harrison	158 (1989) 356
Mazzacurati, V., M.A. Ricci, G. Ruocco and M. Sampoli, Low-frequency Raman spectra of liquid water: a molecular dynamics simulation	159 (1989) 383
McCammon, J.A., see C.F. Wong	154 (1989) 151
McCann, M.P., see C.H. Chen	153 (1988) 338
McClure, D.S., see C. Campochiaro	157 (1989) 78
McCoy, M.A. and R.R. Ernst, Nuclear spin noise at room temperature	159 (1989) 587
McCurdy, C.W., see S.D. Parker	156 (1989) 483
McCurdy, K.E., see J. Wormhoudt	156 (1989) 47; 158 (1989) 480
McCurdy, K.E., see S.M. Anderson	157 (1989) 531
McDaniel, A.H., see C.A. Cantrell	152 (1988) 274
McDonald, D.B., see A.M. Brearley	155 (1989) 83
McKellar, A.R.W., see N. Moazzen-Ahmadi	151 (1988) 318; 157 (1989) 1
McKenzie, D.C., see B. Focher	158 (1989) 491
McKillop, J.S., see J.O. Chu	155 (1989) 576
McLauchlan, K.A. and N.J.K. Simpson, The transfer of electron spin polarization (CI-DEP) to secondary radicals	154 (1989) 550
McLean, A.D., see D.J. DeFrees	158 (1989) 540
McMillan, K., D. Bender, M. Eliades, D. Danzeiser, B.A. Wofford and J.W. Bevan, Supersonic molecular beam and static gas phase spectroscopy of intermolecular hot bands associated with $\nu_1$ $^{16}\text{O}^{12}\text{C}-^1\text{H}^{19}\text{F}$	152 (1988) 87
McMorrow, D., see C. Kalpouzos	155 (1989) 240
McNab, I.R., see A. Carrington	151 (1988) 258; 160 (1989) 237
McNaughton, D., see R.D. Brown	156 (1989) 61
McPherson, G.L., see R.L. Blakley	157 (1989) 398
Meads, R.F., D.C.J. Marsden, J.A. Harrison and L.F. Phillips, Photoexcitation of stannane and diborane at 193 nm	160 (1989) 342
Medina, J., see M. Castillejo	157 (1989) 41
Medina-Llanos, C., see H. Ågren	153 (1988) 322
Meech, S.R. and K. Yoshihara, Picosecond dynamics of adsorbates by time-resolved surface second-harmonic generation	154 (1989) 20
Meera, N. and P. Ramamurthy, Photochemistry of nitrate ion in acetonitrile	153 (1988) 13
Mehadji, C., see M. Morin	159 (1989) 472
Mehring, M., see S. Zhang	160 (1989) 644
Meier, G.E.A., see A. Dillmann	160 (1989) 71
Meijerink, A., see G. Blasse	154 (1989) 420
Mele, A., see V. Di Napoli	154 (1989) 217
Mel'nikov, L.Yu., see V.A. Kochelap	157 (1989) 67
Mendenhall, G.D., see X. Guo	152 (1988) 146
Menz, D.-H., see G. Scholz	156 (1989) 125
Mercouris, Th., see C.A. Nicolaides	159 (1989) 45
Merkt, F., see A. Amrein	152 (1988) 275
Merritt, C.D., see B.L. Justus	156 (1989) 64
Merritt, C.D., A.L. Huston, B.L. Justus and A.J. Campillo, Ultrafast shock-induced uniaxial strain in a liquid	159 (1989) 349

- Merz, A., M.W. Müller, M.-W. Ruf, H. Hotop, W. Meyer and M. Movre, Substantial angular dependence of the electron energy spectra for attractive Penning ionization systems:  $\text{He}(2^3\text{S}, 2^1\text{S}) + \text{Li}(2^2\text{S})$  160 (1989) 377
- Messmer, H.-P., see A. Dodhy 151 (1988) 133
- Mestdag, J.M., see C. Alcaraz 156 (1989) 191
- Metiu, H., see V. Engel 152 (1988) 1; 155 (1989) 77
- Metiu, H., see A.E. DePristo 155 (1989) 376
- Metiu, H., see R. Heather 157 (1989) 505
- Metropoulos, A., see I.D. Petsalakis 158 (1989) 229
- Meyer, W., see A. Merz 160 (1989) 377
- Meynadier, P., see C. Alcaraz 156 (1989) 191
- Michael, A., see V. Kushawaha 154 (1989) 599
- Michaut, J.P., see L. Bonazzola 153 (1988) 52
- Michel-Beyerle, M.E., M. Bixon and J. Jortner, Interrelationship between primary electron transfer dynamics and magnetic interactions in photosynthetic reaction centers 151 (1988) 188
- Michels, H.H., see G. Pichler 156 (1989) 467
- Miehé, J.A., see C. Eckert 153 (1988) 357
- Miehé, J.A., see J.-P. Launay 160 (1989) 89
- Miehlich, B., A. Savin, H. Stoll and H. Preuss, Results obtained with the correlation energy density functionals of Becke and Lee, Yang and Parr 157 (1989) 200
- Mikkelsen, K.V., see H. Ågren 153 (1988) 322
- Mikkola, J., see M. Yliperttula 152 (1988) 61
- Milder, S.J., see R.A. Goldbeck 156 (1989) 545
- Millen, D.J., see A.S. Georgiou 155 (1989) 447
- Miller, G.E., see J.B. Halpern 155 (1989) 347
- Miller, J.T., K.A. Burton, R.B. Weisman, W.-X. Wu and P.S. Engel, CARS spectroscopy of gas phase  $\text{CD}_3$  158 (1989) 179
- Miller, L.L., see S.R. Flom 154 (1989) 193
- Miller, R.D., see L.M. Samuel 159 (1989) 227
- Miller, R.E., see D.C. Dayton 153 (1988) 285; 156 (1989) 578
- Miller, T.A., see M.F. Cai 158 (1989) 475
- Miller, W.H., see N. Makri 151 (1988) 1
- Miller, W.H., see J.Z.H. Zhang 153 (1988) 465; 159 (1989) 130
- Millot, C., J.L. Rivail and R. Diguët, Static dielectric constant density and temperature dependence for the TIPS model of liquid methyl chloride 160 (1989) 228
- Milov, A.D., see P.G. Belov 151 (1988) 79
- Miron, E., see R. Reisfeld 160 (1989) 43
- Mishra, A.K. and H. Shizuka, Dual emission from the contact and separated ion pairs in polyethylene films at 77 K 151 (1988) 379
- Mishra, B.K., see R.K. Mishra 151 (1988) 44
- Mishra, R.K. and B.K. Mishra, A critical assessment of closed- and open-shell heterocyclobutadienes 151 (1988) 44
- Misu, A., see K. Tsukiyama 152 (1988) 523
- Mitchell, J.B.O. and S.L. Price, On the electrostatic directionality of  $\text{N-H}\cdots\text{O}=\text{C}$  hydrogen bonding 154 (1989) 267
- Mitchell, S.A., see J.M. Parnis 151 (1988) 485
- Mittal, J.P., see H. Pal 151 (1988) 75
- Miyawaki, J., see K. Yamanouchi 156 (1989) 301

- Miyoshi, A., H. Matsui and N. Washida, Reactions of hydroxyethyl radicals with oxygen and nitric oxide 160 (1989) 291
- Mizoguchi, N., Circuit resonance energies for Hückel and Möbius polycyclic conjugated molecules 158 (1989) 383
- Mizrahi, V., G.I. Stegeman and W. Knoll, Anisotropic orientation distribution in polycrystalline Langmuir-Blodgett monolayers revealed by second-harmonic generation 156 (1989) 392
- Mlynárik, V., Measurement of scalar relaxation of multiple-quantum coherences by spin echo techniques 160 (1989) 25
- Moazzen-Ahmadi, N., A.R.W. McKeilar and J.W.C. Johns, Far-infrared observations of rotation-tunneling and torsional transitions in the HCl dimer 151 (1988) 318
- Moazzen-Ahmadi, N., A.R.W. McKellar and T. Amano, Laboratory observation of the rotation-vibration spectrum of gas-phase C<sub>3</sub> 157 (1989) 1
- Möbius, D., see R. Loschek 151 (1988) 176
- Möbius, D., see M. Orrit 156 (1989) 233
- Möbius, K., see S.P. Greiner 155 (1989) 93
- Moccia, R., see I. Celicelli 155 (1989) 210
- Mochizuki, Y., K. Tanaka, K. Ohno, H. Tatewaki and S. Yamamoto, Ab initio CAS SCF/MRSDCI study of the CuCH<sub>2</sub> cluster 152 (1988) 457
- Modes, S. and P. Lianos, Structural study of silicate glasses by luminescence probing: the nature of small semiconductor particles formed in glasses 153 (1988) 351
- Mödl, A., K. Domen and T.J. Chuang, Laser-induced CH<sub>2</sub> and C<sub>2</sub>H<sub>4</sub> formation and desorption from CH<sub>2</sub>I<sub>2</sub> adsorbed on Al surfaces 154 (1989) 187
- Moerner, W.E., see T.P. Carter 151 (1988) 102
- Mohan, V. and J.B. Anderson, Effect of crystallite shape on exciton energy: quantum Monte Carlo calculations 156 (1989) 520
- Mohanty, A.K. and E. Clementi, Kinetically balanced geometric Gaussian basis set calculations for relativistic many-electron atoms with finite nuclear size 157 (1989) 348
- Mohr, S., see R. Dören 160 (1989) 602
- Mohsin, S.B., M. Trenary and H.J. Robota, Kinetics of ethylidyne formation on Pt(111) from time-dependent infrared spectroscopy 154 (1989) 511
- Möhwald, H., see S. Kirstein 154 (1989) 303
- Mokhtari, A., J. Chesnoy and A. Laubereau, Femtosecond time- and frequency-resolved fluorescence spectroscopy of a dye molecule 155 (1989) 593
- Molina, A., see J. Albaladejo 152 (1988) 519
- Möller, T., see J. Wörmer 159 (1989) 321
- Monchicourt, P., P. Pradel, D. Dubreuil and J.J. Laucagne, Polarization dependence in the laser-assisted ionizing collision He\*(2<sup>1,3</sup>S) + He(1<sup>1</sup>S) + ħω → He<sup>+</sup>(1<sup>2</sup>S) + He(1<sup>1</sup>S) + e<sup>-</sup> 152 (1988) 336
- Monchicourt, P., see P. Pradel 158 (1989) 412
- Moncrieff, D., see S. Li 151 (1988) 403
- Monkhouse, P., see R. Schwarzwald 158 (1989) 60
- Monnier, M., see P. Roubin 160 (1989) 345
- Mons, H.E., see W.H.E. Schwarz 156 (1989) 275
- Montgomerie, C.A., see A. Carrington 151 (1988) 258; 160 (1989) 237
- Montgomery Jr., J.A., G.A. Petersson and N. Matsunaga, On the helium pair potential 155 (1989) 413
- Moore, E.A., M. Mortimer, N.F. Peirson and G. Oates, A <sup>19</sup>F NMR study of the asymmetric short hydrogen bond in the crystalline adduct between potassium fluoride and succinic acid 151 (1988) 213

- Moortgat, G.K., see O. Horie 156 (1989) 39; 158 (1989) 178
- Moortgat, G.K., B. Veyret and R. Lesclaux, Kinetics of the reaction of HO<sub>2</sub> with CH<sub>3</sub>C(O)O<sub>2</sub> in the temperature range 253-368 K 160 (1989) 443
- Moorthy, P.N., see K.I. Priyadarsini 157 (1989) 525
- Mooyman, R., see O. Grabandt 155 (1989) 221; 160 (1989) 359
- Mordziński, A., Polyethylene as a medium for eliminating the solvent perturbation in intramolecular proton transfer systems 152 (1988) 151
- Mordziński, A., see A. Grabowska 153 (1988) 389
- Morelli, G., see F. Lelj 160 (1989) 39
- Moreno, M., see E. Bosch 160 (1989) 543
- Mori, K., see H. Hiratsuka 157 (1989) 35
- Mori, T., see K. Hiraoka 157 (1989) 467
- Mori, Y., see Y. Kotagiri 158 (1989) 440
- Morikawa, E., see R. Reininger 159 (1989) 276
- Morin, M., D.R. Salahub, S. Nour, C. Mehadji and H. Chermette, Spin-orbit coupling in the local spin density-scattered wave method 159 (1989) 472
- Moro, G., see A. Ferrarini 151 (1988) 531
- Morokuma, K., see S. Yabushita 153 (1988) 517
- Morrow, M.E., R.C. Dye and C.J. Eckhardt, Raman and reflection spectra of a polymorph of the polydiacetylene TCDU 158 (1989) 499
- Mortimer, M., see E.A. Moore 151 (1988) 213
- Morton, J., B. Schueler and K. Mauersberger, Oxygen fractionation of ozone isotopes <sup>48</sup>O<sub>3</sub> through <sup>54</sup>O<sub>3</sub> 154 (1989) 143
- Morton, J., see S.M. Anderson 156 (1989) 175
- Motyka, A.L., see S.A. Wittmeyer 151 (1988) 384; 154 (1989) 1
- Motyka, A.L., see A.J. Kaziska 154 (1989) 199
- Motyka, A.L., see C.-J. Ho 158 (1989) 51
- Movre, M., see A. Merz 160 (1989) 377
- Muckerman, J.T. and M.S. Child, An analytic semiclassical model for local and normal stretching modes in AB<sub>2</sub> molecules 153 (1988) 477
- Mukai, M., see M. Koyanagi 154 (1989) 577
- Mukai, Y., see H. Hashimoto 152 (1988) 319
- Mukamel, S., see Y. Hu 160 (1989) 410
- Mukherjee, D., see D. Sinha 154 (1989) 544
- Mukherjee, P.K., see K. Takeshita 160 (1989) 193
- Mukherjee, T., see H. Pal 151 (1988) 75
- Mukhopadhyay, S.K., see D. Sinha 154 (1989) 544
- Mulford, R.N., see K.C. Kim 159 (1989) 327
- Müller, A., see H. Kleindienst 157 (1989) 426
- Müller, M.W., see A. Merz 160 (1989) 377
- Müller, S.C., see Zs. Nagy-Ungvarai 156 (1989) 433
- Müller-Dethlefs, K., see G. Reiser 152 (1988) 119
- Müller-Plathe, F. and L. Laaksonen, Hartree-Fock-limit properties for SiC, SiN, Si<sub>2</sub>, Si<sub>2</sub><sup>+</sup> and SiS 160 (1989) 175
- Munakata, T. and T. Kasuya, Ion pair production from CH<sub>3</sub>Cl and CH<sub>3</sub>Br with 118 nm laser light 154 (1989) 604
- Munk, J., see P. Pagsberg 157 (1989) 271

Murai, T., see A. Regev	160 (1989) 401
Murray, J.S. and P. Politzer, Electrostatic potentials of amine nitrogens as a measure of the total electron-attracting tendencies of substituents	152 (1988) 364
Murrell, J.N., see A.J. Marks	154 (1989) 492
Mutai, K., see R. Nakagaki	154 (1989) 581
Muus, L.T., Time dependence in the photoreduction of two <i>t</i> -butyl compounds by microsecond resolved electron spin resonance	160 (1989) 17
Myers, A.B., see X. Ci	158 (1989) 263
Myrick, M.L., R.L. Blakley and M.K. DeArmond, The number and spacing of levels in the emitting manifold of $[\text{Ru}(\text{bpy})_3]^{2+}$ low temperature measurements	157 (1989) 73
Myslik, V., see V. Švorčík	157 (1989) 390
Myslinski, P., D. Wiczorek and K. Kownacki, Picosecond fluorescence anisotropy measured by frequency conversion	155 (1989) 256

- Naaman, R., see S.R. Cohen 152 (1988) 269
- Nachman, D.F., see T.C. Steimle 153 (1988) 534
- Nadkhin, A.I., see S.A. Sotnichenko 153 (1988) 560
- Nafie, L.A. and T.B. Freedman, Dual circular polarization Raman optical activity 154 (1989) 260
- Nag, A. and K. Bhattacharyya, Twisted intramolecular charge transfer emission of dimethylaminobenzonitrile in  $\alpha$ -cyclodextrine cavities 151 (1988) 474
- Nag, A., R. Dutta, N. Chattopadhyay and K. Bhattacharyya, Effect of cyclodextrine cavity size on twisted intramolecular charge transfer emission: dimethylamino benzonitrile in  $\beta$ -cyclodextrine 157 (1989) 83
- Nag, A., T. Kundu and K. Bhattacharyya, Effect of solvent polarity on the yield of twisted intramolecular charge transfer (TICT) emission. Competition between formation and nonradiative decay of the TICT state 160 (1989) 257
- Nagai, H., see K. Shibuya 152 (1988) 129
- Nagakura, S., see R. Nakagaki 154 (1989) 581
- Nagana Gowda, G.A., see P. Diehl 159 (1989) 199, 318
- Nagaoka, S., see K. Ueda 154 (1989) 357
- Nagaoka, S., I. Koyano, K. Ueda, E. Shigemasa, Y. Sato, A. Yagishita, T. Nagata and T. Hayaishi, Site-specific fragmentation following inner-core level excitation of  $\text{Pb}(\text{CH}_3)_4$  in the vapor phase 154 (1989) 363
- Nagase, S., see T. Kudo 156 (1989) 289
- Nagashima, Y., see H. Sekiya 160 (1989) 581
- Nagata, T., see A. Nakajima 151 (1988) 511
- Nagata, T., see K. Ueda 154 (1989) 357
- Nagata, T., see S. Nagaoka 154 (1989) 363
- Nagy-Ungvarai, Zs., S.C. Müller and B. Hess, Spatial patterns in the Briggs-Rauscher reaction 156 (1989) 433
- Naik, D.B., see K.I. Priyadarsini 157 (1989) 525
- Nair, K.P.R., see J. Hoelt 155 (1989) 273
- Nakagaki, R., K. Mutai and S. Nagakura, Photochemistry of chain molecules containing 4-nitro-1-naphthoxyl and anilino chromophores. Switching of reaction pathways due to methylene chain length and magnetic field effects 154 (1989) 581
- Nakagawa, K., A. Ejiri, M. Nishikawa and K. Kimura, Density effect on structures in photoconductivity excitation spectra of supercritical xenon doped with anthracene molecules 155 (1989) 278
- Nakagawa, K., see H. Uehara 160 (1989) 149
- Nakajima, A., T. Nagata, T. Kondow and K. Kuchitsu, Rotational distributions of  $\text{CO}_2^+(\tilde{X}^2\Pi_g)$  produced by electron-impact ionization of supercooled  $\text{CO}_2$  151 (1988) 511
- Nakamura, A., see A.L. Verma 159 (1989) 189
- Nakamura, H., see H. Yonemura 155 (1989) 157
- Nakamura, K., T. Takayanagi and S. Sato, A modified Arrhenius equation 160 (1989) 295
- Nakamura, T., see Y. Hidaka 154 (1989) 573
- Nakanaga, T., see K. Sugawara 157 (1989) 309
- Nakanaga, T., M. Matsumoto, Y. Kawabata, H. Takeo and C. Matsumura, Observation of FTIR-PA spectra of Langmuir-Blodgett films of cadmium arachidate on glass plates 160 (1989) 129
- Nakano, H., see T. Nogami 155 (1989) 338
- Nakashima, N., see N. Shimo 156 (1989) 31
- Narasimhan, L.R., D.W. Pack and M.D. Fayer, Solute-solvent dynamics and interactions in glassy media: photon echo and optical hole burning studies of cresyl violet in ethanol glass 152 (1988) 287



Narayanan, K., G. Ullas and S.B. Rai, One- and two-photon optogalvanic spectrum of Ne: 610-730 nm	156 (1989) 55
Nazeeruddin, Md.K., see K. Kalyanasundaram	158 (1989) 45
Nédélec, O., see M. Giroud	152 (1988) 167
Neeleman, E., see G. Blasse	154 (1989) 420
Neely, W.C., E.I. Newhouse, S. Pathirana and S.D. Worley, An AM1 SCF MO study of the reaction of formaldehyde with atomic oxygen	155 (1989) 381
Nelson Jr., D.D., A. Schiffman, K.R. Lykke and D.J. Nesbitt, A simple F-center laser spectrometer for continuous single frequency scans	153 (1988) 105
Nenner, I., see K. Ito	151 (1988) 121
Nepraš, M., S. Luňák Jr., R. Hrdina and J. Fabian, Electronic excited states of azo compounds: strong $\pi\pi^*$ fluorescence of bis-4,4'-diethylaminoazobenzene	159 (1989) 366
Nesbitt, D.J., see D.D. Nelson Jr.	153 (1988) 105
Neshyba, S.P., see N. de Leon	151 (1988) 296
Neumark, D.M., see T.N. Kitsopoulos	159 (1989) 300
Newhouse, E.I., see W.C. Neely	155 (1989) 381
Newman, J., see P.L. San Biagio	154 (1989) 477
Newmark, R.D., see S.A. Campbell	155 (1989) 89
Ng, C.Y., see K. Norwood	156 (1989) 145
Nguyen, M.T., Isocyanogen (NCNC) and diisocyanogen (CNNC): structures and some spectroscopic properties	157 (1989) 430
Nguyen, M.T. and T.-K. Ha, 1,2 hydrogen shifts in thioformaldehyde ( $H_2C=S$ ), phosphazene ( $HN=PH$ ) and diphosphene ( $HP=PH$ ): in-plane versus out-of-plane migration	158 (1989) 135
Ni, X., see G. Sun	151 (1988) 54
Nibler, J.W., see R. Beck	159 (1989) 79
Niccolai, N., see C. Rossi	156 (1989) 438
Nicolaides, C.A., P. Valtazanos and N.C. Bacalis, Excited molecules and clusters in solid media. Hydrogen and tetrahydrogen in ionic crystals	151 (1988) 22
Nicolaides, C.A., see J.N. Silverman	153 (1988) 61
Nicolaides, C.A., see P. Valtazanos	156 (1989) 240
Nicolaides, C.A., see I.D. Petsalakis	158 (1989) 229
Nicolaides, C.A. and Th. Mercouris, Multiphoton ionization of negative ions in the presence of a dc field. Application to $Li^-$	159 (1989) 45
Nicoli, D.F., see B. Focher	158 (1989) 491
Nie, W., G. Boulon and J. Mares, Spectroscopy of multisites chromium(III) in yttrium aluminium garnet	160 (1989) 597
Nielsen, O.J., H.W. Sidebottom, D.J. O'Farrell, M. Donlon and J. Treacy, Rate constants for the gas-phase reactions of OH radicals and Cl atoms with $CH_3CH_2NO_2$ , $CH_3CH_2CH_2NO_2$ , $CH_3CH_2CH_2CH_2NO_2$ , and $CH_3CH_2CH_2CH_2CH_2NO_2$	156 (1989) 312
Nightingale, J., see R.N. Dixon	151 (1988) 328
Niles, S. and C.A. Wight, Photofragment spectroscopy of nitrosobenzene	154 (1989) 458
Nishi, N., see H. Shinohara	153 (1988) 417
Nishi, T., see T. Shimada	158 (1989) 435
Nishikawa, M., see K. Nakagawa	155 (1989) 278
Nishimura, A.M., see N.J. Tro	159 (1989) 599
Nishimura, Y., see M. Tsuji	155 (1989) 481; 158 (1989) 470
Nishimura, Y., see H. Sekiya	160 (1989) 581

Nitzan, A., see Z. Kotler	153 (1988) 483
Niu, B., see L. Wang	158 (1989) 297
Noga, J., see V. Kellö	152 (1988) 387
Noga, J., see C. Sosa	153 (1988) 139
Noga, J., see R.J. Bartlett	155 (1989) 133
Nogami, T., H. Nakano, Y. Shirota, S. Umegaki, Y. Shimizu, T. Uemiya and N. Yasuda, Optical second-harmonic generation from a series of [cyano(alkyloxycarbonyl)- meth- ylene]-2-ylidene-1,3-dithiols and their methyl and dimethyl derivatives	155 (1989) 338
Noguchi, T., S. Sato and Y. Fujimura, Coriolis coupling effects on the angular distribution of photoelectrons from time-resolved two-photon ionization of polyatomic molecules	155 (1989) 177
Noid, D.W., J.E. Bloor, M. Spotswood and M.L. Koszykowski, Calculation of ab initio fre- quencies from short time classical trajectories	154 (1989) 391
Nomura, O., see S. Ikuta	154 (1989) 71
Nonose, S., Y. Sone, N. Kikuchi, K. Fuke and K. Kaya, Reaction of vanadium and cobalt clusters with ethylene and acetylene	158 (1989) 152
Nordfors, D., see V. Carravetta	152 (1988) 190
Nordholm, S., see N. Markovic	159 (1989) 435
Nordio, P.L., see A. Ferrarini	151 (1988) 531
Noréus, D. and J. Tomkinson, Inelastic neutron scattering studies of a novel linear PdH <sub>2</sub> complex in Na <sub>2</sub> PdH <sub>2</sub>	154 (1989) 439
Northrup, F.J. and T.J. Sears, Observation of stimulated emission pumping spectra of jet- cooled NCS and C <sub>3</sub>	159 (1989) 421
Norwood, K. and C.Y. Ng, Photoion-photoelectron coincidence spectroscopy of the tran- sient molecules SO and S <sub>2</sub> O	156 (1989) 145
Notholt, J. and P.K. Ludwig, On the assignment of the central line ( $\approx 1025\text{ cm}^{-1}$ ) in the SERS spectrum of aqueous pyridine solutions	154 (1989) 101
Nouchi, G., see C. Cazeau-Dubroca	157 (1989) 393
Nour, S., see M. Morin	159 (1989) 472
Nowak, M.J., L. Lapinski and J.S. Kwiatkowski, An infrared matrix isolation study of tau- tomerism in purine and adenine	157 (1989) 14
Nozik, A.J., see P.V. Kamat	157 (1989) 384
Nunes, M.D., see P.B. Davies	156 (1989) 553
Nyman, G., see N. Markovic	159 (1989) 435

Oates, G., see E.A. Moore	151 (1988) 213
Obase, H., see M. Tsuji	155 (1989) 481
Oberhammer, H., see H.-G. Mack	157 (1989) 436
Obi, K., see K. Shibuya	152 (1988) 129
Obi, K., see K. Takahashi	154 (1989) 223
Obi, K., see H. Hiratsuka	157 (1989) 35
Obi, K., see T. Ishiwata	159 (1989) 594
O'Brien, J.J., see P. Vujkovic Cvijin	159 (1989) 331
O'Brien, M.C.M., see C. Samet	159 (1989) 567
Oesterheld, D., see W. Holzapfel	160 (1989) 1
O'Farrell, D.J., see O.J. Nielsen	156 (1989) 312
Ogilvie, J.F., see B.-M. Cheng	151 (1988) 109
Ogilvie, J.F., see L. Farnell	156 (1989) 129
Ogilvie, J.F. and Y.-P. Lee, Linestrengths in the 3-0 vibration-rotational band of gaseous $^1\text{H}^{35}\text{Cl}$ and the electric dipole moment function	159 (1989) 239
Oh, D., see G. Hoffmann	155 (1989) 356
Oh, D., see Y. Chen	159 (1989) 426
Oh, J.-J., see M.S. LaBarge	159 (1989) 559
Ohmes, E., see J. Fessmann	152 (1988) 491
Ohno, K., see Y. Mochizuki	152 (1988) 457
Ohno, K. and H. Matsuura, The $\text{C}=\text{P}$ stretching vibration of phenylmethyldynephosphine $\text{PhC}=\text{P}$ studied by infrared spectroscopy	155 (1989) 443
Ohrendorf, E., L.S. Cederbaum and H. Köppel, On multidimensional avoided crossings of potential energy surfaces	151 (1988) 273
Ohshima, Y., Y. Matsumoto, M. Takami and K. Kuchitsu, Comment on "The structure and tunneling motion of acetylene dimer studied by free-jet infrared absorption spectroscopy in the 14 $\mu\text{m}$ region"	152 (1988) 116
Ohshima, Y., Y. Matsumoto, M. Takami and K. Kuchitsu, Free-jet infrared absorption spectroscopy of the $(\text{N}_2\text{O})_2$ van der Waals complex in the 8 $\mu\text{m}$ region	152 (1988) 294
Ohta, J., see M. Yagi	160 (1989) 13
Ohta, K., Flux analysis of electron and spin transfer processes	156 (1989) 368
Ohta, N., Fluorescence enhancement by an external magnetic field in pyrimidine- $d_4$ in a supersonic jet	151 (1988) 93
Ohtaki, H., see T. Radnai	159 (1989) 532
Okabe, H., see J.B. Halpern	155 (1989) 347
Okada, S., see O. Matsuoka	155 (1989) 547
Okada, T., see H. Kobashi	160 (1989) 261
Okamoto, H., see T. Arai	157 (1989) 46
Okazaki, M. and K. Toriyama, Formation of glassy islands and deterioration of crystal structure in irradiated long chain $n$ -alkane crystals detected by high resolution NMR	160 (1989) 21
Olejnik, J., see B. Brzezinski	156 (1989) 213
Oliver, A.M., see K.J. Smit	152 (1988) 177
Olsen, J., A.M.S. de Merás, H.J.Aa. Jensen and P. Jørgensen, Excitation energies, transition moments and dynamic polarizabilities for $\text{CH}^+$ . A comparison of multiconfigurational linear response and full configuration interaction calculations	154 (1989) 380
Olson, W.B., see B.A. Wofford	152 (1988) 299
Onai, Y., see T. Matsushima	157 (1989) 55

- Onori, G., Structural properties of aqueous mixtures of monohydric alcohols from near-infrared absorption spectra 154 (1989) 212
- Oppenheim, I. and R.D. Levine, Proposed cooperative model of dissociative chemisorption 155 (1989) 168
- Orozco, M. and F.J. Luque, On the use of mixed basis sets to compute accurate molecular electrostatic potentials 160 (1989) 305
- Orr, B.J., see C.P. Bewick 159 (1989) 66, 73
- Orrit, M., J. Bernard and D. Möbius, Hole burning of an ionic dye in a Langmuir-Blodgett monolayer 156 (1989) 233
- Ortiz, J.V., An electron propagator study of bonding in aminoborane 156 (1989) 489
- Orton, E., see W.E. Brewer 158 (1989) 345
- Osgood Jr., R.M., see P.S. Shaw 151 (1988) 449
- Ossig, F., see A. Penzkofer 154 (1989) 111
- Oster, T., see J. Hacaloglu 153 (1988) 268
- Ottinger, Ch., see L. Chow Chiu 151 (1988) 220; 157 (1989) 60
- Otto, A., see S.A. Bilmes 159 (1989) 89
- Otto, P., see P. Saalfrank 153 (1988) 451
- Oujia, B., M.-B. Lepetit and J.-P. Malrieu, From highly delocalized to strongly correlated domains through a unique MO into VB exponential transformation 158 (1989) 559

- Pack, D.W., see L.R. Narasimhan 152 (1988) 287
- Pack, R.T, see J.D. Kress 157 (1989) 484
- Paddon-Row, M.N., see K.J. Smit 152 (1988) 177
- Pagsberg, P., J. Munk, C. Anastasi and V. Simpson, UV spectrum of CD<sub>2</sub>OD and its reactions with O<sub>2</sub>, NO and NO<sub>2</sub> 157 (1989) 271
- Pahapill, J. and L. Rebane, Persistent spectral hole-burning in heme proteins: cytochrome c and myoglobin 158 (1989) 283
- Paidarová, I., see J. Vojtík 157 (1989) 337
- Pal, H., D. Palit, T. Mukherjee and J.P. Mittal, The fluorescence lifetimes of isomeric tyrosines 151 (1988) 75
- Pal, S., M. Rittby and R.J. Bartlett, Multi-reference coupled-cluster methods for ionization potentials with partial inclusion of triple excitations 160 (1989) 212
- Palacin, S., see T.-H. Tran-Thi 157 (1989) 92
- Palchan, I., M. Crespin, H. Estrade-Szwarckopf and B. Rousseau, Graphite fluorides: an XPS study of a new type of C-F bonding 157 (1989) 321
- Paldus, J., see S. Zarrabian 155 (1989) 183
- Pálinkás, G., see E. Hawlicka 154 (1989) 255
- Palit, D., see H. Pal 151 (1988) 75
- Palm, V.V., see A.A. Gorokhovskii 153 (1988) 328
- Palma, M.U., see F. Sciortino 153 (1988) 557
- Palma, M.U., see P.L. San Biagio 154 (1989) 477
- Pan, H., On the partition function of free internal rotation. A semiclassical approach 151 (1988) 35
- Panas, I. and P. Siegbahn, A theoretical study of the peroxo and superoxo forms of molecular oxygen on metal surfaces 153 (1988) 458
- Panić, B., see V. Urošević 155 (1989) 325
- Papailiou, M., C. Pouchan and A. Dargelos, A theoretical study of the vibrational structure of the <sup>2</sup>A<sub>1</sub> band in NF<sub>3</sub>: potential curves and Franck-Condon analysis 155 (1989) 406
- Pape, D.A., see P.B. Davies 156 (1989) 553
- Papon, P., see P.P. Man 151 (1988) 143
- Parenteau, L., see R. Azria 156 (1989) 606
- Parker, D.H., see D.W. Chandler 156 (1989) 151
- Parker, G.A., see J.D. Kress 157 (1989) 484
- Parker, S.D. and C.W. McCurdy, Propagation of wave packets using the complex basis function method 156 (1989) 483
- Parker, W.L., see W.F. Cooper 156 (1989) 463
- Parnis, J.M., S.A. Mitchell and P.A. Hackett, Complexation and abstraction channels in the Al+CO<sub>2</sub> reaction 151 (1988) 485
- Parson, J.M., J.H. Wang, C.C. Fang and B.S. Cheong, Chemiluminescent reactions of Sn<sub>2</sub>, Ge<sub>2</sub>, and Si<sub>2</sub> with O<sub>2</sub> 152 (1988) 330
- Parson, R., see W.J. Hovingh 158 (1989) 222
- Partridge, H., see C.W. Bauschlicher Jr. 160 (1989) 183
- Pasternack, L., B.R. Weiner and A.P. Baronavski, Rotational distributions of CO from the 193 nm photodissociation of BH<sub>3</sub>CO using nonresonant four-wave mixing for VUV generation 154 (1989) 121
- Pasterny, K., see A. Kocot 156 (1989) 351
- Pasterny, K. and A. Kocot, A comparison between the confined rotator model and experimental orientational correlation functions for N<sub>2</sub>O dissolved in liquid SF<sub>6</sub> 156 (1989) 550

- Pastore, G., see D. Gazzillo 159 (1989) 388
- Pathirana, S., see W.C. Neely 155 (1989) 381
- Paul, A., W.H. Fink and W.M. Jackson, CN( $X^2\Sigma$ ) fine structure populations formed in the photofragmentation of BrCN as a function of wavelength 153 (1988) 121
- Paul, D.K., S.D. Worley, N.W. Hoffman, D.H. Ash and J. Gautney, The nature of the surface site for isocyanate produced in the reaction of ammonia and carbon monoxide over supported catalysts 160 (1989) 559
- Paul, H., see F. Jent 160 (1989) 632
- Pawlikowski, M. and O. Sonnich Mortensen, Symmetry and magnetic vibrational circular dichroism spectra of doubly degenerate vibrational modes 158 (1989) 289
- Pebay-Peyroula, J.-C., see P. Baltayan 160 (1989) 549
- Pecul, K., see W.A. Sokalski 153 (1988) 153
- Peet, A.C., see W. Yang 153 (1988) 98
- Pei, Y., see D. Gatteschi 160 (1989) 157
- Peifer, W.R., see M.T. Coolbaugh 156 (1989) 19
- Peirigua, A., see C. Cazeau-Dubroca 157 (1989) 393
- Peirson, N.F., see E.A. Moore 151 (1988) 213
- Peled, A. and L.B. Schein, Hole mobilities that decrease with increasing electric fields in a molecularly doped polymer 153 (1988) 422
- Pellegatti, A., see F. Marinelli 158 (1989) 545
- Pelmenev, A.A., see E.B. Gordon 155 (1989) 301
- Penzkofer, A. and F. Ossig, Absorption recovery of the pyrimidocarbocyanine dye PYC 154 (1989) 111
- Perales, F., see P. Feron 160 (1989) 555
- Percy, L.T., see D.W. Werst 153 (1988) 45
- Perdrix, M., see P. Pradel 158 (1989) 412
- Periasamy, N., G.C. Joshi and R. Das, A "long-time" approximation for the intensity decay equation in diffusion-limited fluorescence quenching reactions 160 (1989) 457
- Perkampus, H.-H., see T. Ledwig 154 (1989) 309
- Persico, M., see R. Cimbriglia 153 (1988) 507
- Persky, A., see R. Edrei 157 (1989) 265
- Persky, A. and H. Kornweitz, Oscillations in product state distributions in the light-atom transfer reactions  $Cl + HCl \rightarrow ClH + Cl$  and  $O + HCl \rightarrow OH + Cl$  159 (1989) 134
- Person, W.B., see K. Szczepaniak 153 (1988) 39
- Persson, A., see H. Bergström 155 (1989) 27
- Persuy, P., see G. Baravian 159 (1989) 361
- Peter, L.M., see S.A. Campbell 155 (1989) 89
- Petersson, G.A., see J.A. Montgomery Jr. 155 (1989) 413
- Petersson, G.A. and W.A. Shirley, The beryllium dimer potential 160 (1989) 494
- Petráš, M., see J. Vojtik 157 (1989) 337
- Petrella, G., A.T. Yinnon and R.B. Gerber, Atom scattering from isolated molecular adsorbates on surfaces: effects of adsorbate orientation 158 (1989) 250
- Petsalakis, I.D., A. Metropoulos, G. Theodorakopoulos and C.A. Nicolaides, An estimate of the lifetime of excited tetrahydrogen 158 (1989) 229
- Petsalakis, I.D., G. Theodorakopoulos and V.J. Barclay, Theoretical calculations on the ground electronic state of  $HeNe^+$  160 (1989) 189
- Pettiette, C.L., see K.J. Taylor 152 (1988) 347
- Pettinger, B., K. Krischer and G. Ertl, Giant Raman scattering cross section for an adsorbed dye at Ag colloids associated with low EM field enhancement 151 (1988) 151



- Peyerimhoff, S.D., see B. Engels 152 (1988) 397
- Peyerimhoff, S.D., see M. Carnell 154 (1989) 484
- Pfannenbergh, S., see R.D. Kenner 156 (1989) 305
- Pfeifer, H., see J. Haase 152 (1988) 254; 156 (1989) 328
- Pfenninger, S., A. Schweiger, J. Forrer and R.R. Ernst, Echo-detected ESR spectroscopy with magnetic field vector jumps: a novel approach for improving the spectral resolution in disordered systems 151 (1988) 199
- Pfenninger, S., see H. Cho 160 (1989) 391
- Philippoz, J.-M., R. Zenobi and R.N. Zare, Pulsed heating of surfaces: comparison between numerical simulation, analytical models, and experiments 158 (1989) 12
- Phillips, D., see A.J. Brown 151 (1988) 247
- Phillips, L.F., see R.F. Meads 160 (1989) 342
- Picard, M., see M. Foucault 156 (1989) 599
- Pichler, G., see D. Fijan 154 (1989) 126
- Pichler, G., A.M. Lyra, P.D. Kleiber, W.C. Stwalley, R. Hammer, K.M. Sando and H.H. Michels, Laser-induced chemiluminescence of the LiMg excimer 156 (1989) 467
- Pickup, B.T. and J.G. Snijders, On the exactness of extended Koopmans' eigenvalues 153 (1988) 69
- Pierlot, A.P., see R.D. Brown 156 (1989) 61
- Pines, A., see T.P. Jarvie 158 (1989) 325
- Pines, D. and D. Huppert, Fractal surface of porous materials as revealed by electronic energy transfer: comparison of silica gels and controlled-pore glasses 156 (1989) 223
- Pinhal, N.M., see H.B. Ambroz 160 (1989) 396
- Pires, J.M., see M. Giambiagi 152 (1988) 222
- Pitzer, K.S. and J.C. Tanger IV, Critical exponents for the coexistence curves for NaCl-H<sub>2</sub>O near the critical temperature of H<sub>2</sub>O 156 (1989) 418
- Pitzer, R.M., see M. Kotzian 160 (1989) 168
- Pizzoli, M., see G. Giro 153 (1988) 583
- Plonka, A., Photodissociation of carbonmonoxy myoglobin: kinetics of protein relaxation to the equilibrium state of deoxymyoglobin 151 (1988) 466
- Plonka, A., J. Kroh and Yu.A. Berlin, Photodissociation of carbon monoxy myoglobin: kinetics of carbon monoxide rebinding 153 (1988) 433
- Plonka, A., Yu.A. Berlin and N.I. Chekunaev, Dispersive recombination in condensed phases 158 (1989) 380
- Pluzhnikov, P.F., see P.P. Levin 152 (1988) 409
- Podgornik, R., Forces between surfaces with surface-specific interactions in a dilute electrolyte 156 (1989) 71
- Podoplelov, A.V., S. Stob and R. Kaptein, Magnetic field dependence of <sup>1</sup>H CIDNP in the reaction of trimethyltin hydride with dibenzyl ketone 160 (1989) 233
- Poirier, R.A. and A. Yadav, An ab initio study of the conformational change around the 6-s-bond in a retinal analogue 156 (1989) 122
- Poizat, O., see G. Buntinx 153 (1988) 279
- Polavarapu, P.L., see P.K. Bose 152 (1988) 39; 155 (1989) 423
- Polavarapu, P.L., see L.D. Barron 154 (1989) 251
- Polimeno, A., see A. Ferrarini 151 (1988) 531
- Politzer, I.R., K.T. Crago, T. Hampton, J. Joseph, J.H. Boyer and M. Shah, Effect of  $\beta$ -cyclodextrin on the fluorescence, absorption and lasing of rhodamine 6G, rhodamine B and fluorescein disodium salt in aqueous solutions 159 (1989) 258

- Politzer, P., see J.S. Murray 152 (1988) 364  
 Politzer, P., J.M. Seminario and P.R. Bolduc, A proposed interpretation of the destabilizing effect of hydroxyl groups on nitroaromatic molecules 158 (1989) 463  
 Politzer, P., see J.M. Seminario 159 (1989) 27  
 Pollak, E., see D.Z. Goodson 151 (1988) 557  
 Pollard, J.E., D.A. Lichtin and R.B. Cohen, Differential cross sections for state-selected reactions in the  $H_2^+ + H_2$  system 152 (1988) 171  
 Pollard, W.T., see S.-Y. Lee 160 (1989) 531  
 Pope, T.D., see M.P. Banjavcic 160 (1989) 371  
 Pople, J.A., see M. Head-Gordon 153 (1988) 503  
 Pople, J.A., see K. Raghavachari 157 (1989) 479; 158 (1989) 207  
 Popov, E.A., see E.B. Gordon 155 (1989) 301  
 Porsch, F. and H. Stegemeyer, Electrostriction of liquid crystalline blue phases 155 (1989) 620  
 Port, H., see K. Ulrich 155 (1989) 437  
 Postma, R., P.J.A. Ruttink, J.H. van Lenthe and J.K. Terlouw, The role of hydrogen-bridged radical cations in the dissociation of ionized glycolaldehyde  $[HOCH_2CHO]^+$  156 (1989) 245  
 Potter, C.A.S. and R.G. Brown, Excited-state intramolecular proton transfer in polar solutions of 2-(2'-hydroxyphenyl)benzothiazole 153 (1988) 7  
 Pouchan, C., see M. Papailhou 155 (1989) 406  
 Pourcin, J., see P. Roubin 160 (1989) 345  
 Powles, J.G. and M.L. Williams, A new and double isosbestic point 156 (1989) 543  
 Pradeep, T., C.S. Sreekanth, M.S. Hegde and C.N.R. Rao, UPS-EELS investigation of the electronic structure of  $BF_3 \cdot H_2S$  151 (1988) 499  
 Pradel, P., see P. Monchicourt 152 (1988) 336  
 Pradel, P., P. Monchicourt, J.J. Laucagne, M. Perdrix and G. Watel, Carbon cluster ion formation in a direct laser vaporization source 158 (1989) 412  
 Prasad, J. and R. Kopelman, Molecular reaction kinetics inside channel pores: delayed fluorescence of naphthalene in methanol 157 (1989) 535  
 Prasad, K.U., see F. Sciortino 153 (1988) 557  
 Prasad, L.S., R.S. Ding, H.-Q. Wang, E.G. Bradford and L.D. Kispert, An EPR study of monomeric and dimeric radical cations of 2,5-dimethyl-2,4-hexadiene and 2,7-dimethyl-2,4,6-octatriene 151 (1988) 443  
 Prasad, S.D., see A. Datar 159 (1989) 337  
 Pratt, S.T., Fluorescence-detected optical-optical double resonance spectroscopy of Rydberg-Rydberg transitions in NO 151 (1988) 138  
 Prendergast, F.G., see P. Ilich 158 (1989) 129  
 Pressman, H.A. and R.C.T. Slade, Internal rotation in the  $H_3O_2^+$  ion: a quasielastic neutron scattering study of 12-tungstophosphoric acid hexahydrate 151 (1988) 354  
 Preuss, H., see B. Miehlich 157 (1989) 200  
 Price, S.L., see J.B.O. Mitchell 154 (1989) 267  
 Priyadarsini, K.I., D.B. Naik and P.N. Moorthy, Studies on the triplet state of coumarin 102 laser dye by pulse radiolysis 157 (1989) 525  
 Prokhorov, A.M., see K.N. El'tsov 158 (1989) 271  
 Proulx, P.P., see J.A. Capobianco 160 (1989) 591  
 Przybytniak, G.K., see H.B. Ambroz 160 (1989) 396  
 Pugachev, O.F., see E.B. Gordon 155 (1989) 301  
 Pulay, P. and J.M. Boffill, Natural charge densities for the evaluation of MC-SCF energy derivatives without density matrix transformation 156 (1989) 501

*Master index to volumes 151-160*

Puri, A., see K.D. Sen	156 (1989) 505
Purvis III, G.D., see C. Sosa	153 (1988) 139
Puyuelo, P., see E. Martínez	156 (1989) 564
Puza, M., see H. Riesen	151 (1988) 65
Pye, D.B., see M. Golombok	151 (1988) 161
Pyykkö, P., Ab initio study of bonding trends among the 22-electron A=B=A systems: evidence for $O=O=O^{2+}$	156 (1989) 337
Pyykkö, P., see M. Hotokka	157 (1989) 415

*Master index to volumes 151-160*

Qi, J., see N.R. Isenor	155 (1989) 283
Qian, K., see J. Biggerstaff	151 (1988) 507
Qin, X.-Z., see F. Gerson	153 (1988) 546
Qiu, A., see R. Gaspar Jr.	156 (1989) 619
Qiu, J., see X. Wang	157 (1989) 87
Quack, M., see A. Amrein	152 (1988) 275
Quack, M., see A.J. Ross	156 (1989) 455
Quack, M., see H. Bürger	156 (1989) 557
Quelch, G.E., see D.L. Clark	154 (1989) 326
Quercia, L., see A. Boschetti	158 (1989) 1
Quinonez, A., see B.A. Wofford	152 (1988) 299

Raas, M.C., see A.H.M. Sondag	155 (1989) 503
Rabalais, J.W., see F. Masson	152 (1988) 325
Rabinowitz, P., see C. Campochiaro	157 (1989) 78
Radenkovic, B., see B.R. Jovanic	158 (1989) 172
Radhakrishnan, T.P., see W.C. Herndon	152 (1988) 233
Radnai, T., S. Ishiguro and H. Ohtaki, Liquid structure of 2,2,2-trifluoroethanol-dimethyl sulfoxide mixtures as studied by X-ray diffraction	159 (1989) 532
Radunsky, M.B. and R.J. Saykally, Non-intrusive measurement of axial electric fields in low-pressure glow discharges by velocity modulation laser spectroscopy	152 (1988) 419
Raghavachari, K., G.W. Trucks, J.A. Pople and M. Head-Gordon, A fifth-order perturbation comparison of electron correlation theories	157 (1989) 479
Raghavachari, K., G.W. Trucks, J.A. Pople and E. Replogle, Highly correlated systems: structure, binding energy and harmonic vibrational frequencies of ozone	158 (1989) 207
Raghavachari, K., see A.-M. Sapse	158 (1989) 213
Raghunathan, P. and B.B. Das, EPR lineshape studies of low-temperature vanadium 3d <sup>1</sup> polaron dynamics in the 70V <sub>2</sub> O <sub>5</sub> -30P <sub>2</sub> O <sub>5</sub> binary glass	160 (1989) 627
Rahman, N.K., see R. Cimiraglia	151 (1988) 38
Rahmat, G., see F.X. Gadéa	151 (1988) 183
Rahner, A., see H. Bürger	156 (1989) 557
Rai, S.B., see K. Narayanan	156 (1989) 55
Raitsimring, A.M., see V.V. Konovalov	157 (1989) 257
Rajab Pacha, S., see G. Brincourt	156 (1989) 573
Rakestraw, D.J., see M.J. Bronikowski	156 (1989) 7
Ram, R.S., see B.A. Wofford	152 (1988) 299
Ramachandran, B., T.-G. Wei and R.E. Wyatt, The role of basis set expansions in the relative performance of the Schwinger and the Newton variational principles	151 (1988) 540
Ramamurthy, P., see N. Meera	153 (1988) 13
Ramasesha, S. and Z.G. Soos, Exact dynamic non-linear susceptibilities of finite correlated models	153 (1988) 171
Ramasesha, S. and I.D.L. Albert, Exact static polarizabilities of correlated finite model systems	154 (1989) 501
Rami Reddy, M. and M. Berkowitz, The dielectric constant of SPC/E water	155 (1989) 173
Ramondo, F., Structures and stabilities of LiNO <sub>2</sub> and NaNO <sub>2</sub> ion pairs: an ab initio SCF study	156 (1989) 346
Ramos, M.N., M. Gussoni, C. Castiglioni and G. Zerbi, Ab initio counterpart of infrared atomic charges. Comparison with charges obtained from electrostatic potentials	151 (1988) 397
Ramos, M.N., M. Gussoni, C. Castiglioni and G. Zerbi, Ab initio counterpart of infrared atomic charges. Comparison with charges obtained from electrostatic potentials, Chem. Phys. Letters 151 (1988) 397. Erratum	152 (1988) 528
Ramos, M.N., see M. Gussoni	160 (1989) 200
Rance, M., Sign reversal of resonances via isotropic mixing in NMR spectroscopy	154 (1989) 242
Randell, J., see A.P. Cox	153 (1988) 253
Rao, C.N.R., see T. Pradeep	151 (1988) 499
Rasing, Th., see X.D. Zhu	155 (1989) 459
Raspa, N., see J.A. Capobianco	160 (1989) 591
Ratajczak, H., see M. Ilczyszyn	153 (1988) 385
Ratner, M.A., see S.D. Druger	151 (1988) 434

- Ratner, M.A., see L. Shen 155 (1989) 119
- Raukhvarger, A.B., M.Ye. Solovyov and V.I. Irzhak, Microphase segregation during de-formation of elastomers 155 (1989) 455
- Ravishankara, A.R., see A. Wahner 152 (1988) 507
- Ray, A.K., see M.S. Islam 153 (1988) 496
- Ray, U., M.F. Jarrold, J.E. Bower and J.S. Kraus, Photodissociation spectroscopy of alu-minum clusters:  $Al_3^+-Al_6^+$  159 (1989) 221
- Raynaud, M., see G. Hennico 152 (1988) 207
- Raynor, J.B., see H.B. Ambroz 160 (1989) 396
- Razuvaev, I.Yu., see S.G. Cheskis 155 (1989) 37
- Read, D., see R.E. Ballard 151 (1988) 477
- Rebane, L., see J. Pahapill 158 (1989) 283
- Reber, C. and H.U. Güdel, Near-infrared luminescence spectroscopy of  $Al_2O_3:V^{3+}$  and  $YPO_4:V^{3+}$  154 (1989) 425
- Récamier, J. and M. Berrondo, Anharmonic effects in the matrix elements of an expo-nential potential 158 (1989) 116
- Redfern, C.M., see D.L. Clark 154 (1989) 326
- Reekmans, S., see A. Malliaris 155 (1989) 587
- Regev, A., A. Berman, H. Levanon, T. Murai and J.L. Sessler, Principal ZFS tensor axes versus optical transition moments of novel expanded porphyrins (texaphyrins). Time-resolved triplet EPR spectroscopy 160 (1989) 401
- Rego, C.A., see A.C. Legon 154 (1989) 468; 157 (1989) 243
- Reguero, M., see C. Valdemoro 152 (1988) 118
- Reid, P.J., S.J. Doig and R.A. Mathies, Direct measurement of the photochemical ring opening in 1,3-cyclohexadiene by picosecond time-resolved UV resonance Raman 156 (1989) 163
- Reimann, K., see A. Brillante 151 (1988) 243
- Reinhardt, J., see P. Feron 160 (1989) 555
- Reinhardt, W.P., see R.E. Gillilan 156 (1989) 478
- Reininger, R., E. Morikawa and V. Saile, Polarization energy of an ion in a medium:  $C_6H_6$  doped into rare gases 159 (1989) 276
- Reinot, T., see J. Subbi 159 (1989) 292
- Reisenauer, H.P., see F. Stroh 160 (1989) 105
- Reiser, G., W. Habenicht, K. Müller-Dethlefs and E.W. Schlag, The ionization energy of nitric oxide 152 (1988) 119
- Reisfeld, R., see D. Brusilovsky 153 (1988) 203
- Reisfeld, R., M. Eyal and D. Brusilovsky, Luminescence enhancement of rhodamine 6G in sol-gel films containing silver aggregates 153 (1988) 210
- Reisfeld, R., see R. Gvishi 156 (1989) 181
- Reisfeld, R., D. Brusilovsky, M. Eyal, E. Miron, Z. Burstein and J. Ivri, A new solid-state tunable laser in the visible 160 (1989) 43
- Replogle, E., see K. Raghavachari 158 (1989) 207
- Rettig, W. and W. Majenz, Competing adiabatic photoreaction channels in stilbene derivatives 154 (1989) 335
- Reynaud, C., see G. Hennico 152 (1988) 207
- Reynhardt, E.C., Spin-lattice relaxation and molecular motions in amorphous fructose 6-phosphate 155 (1989) 317
- Reynhardt, E.C., Spin-lattice relaxation and molecular motion in the sodium salt of phosphoenolpyruvate 159 (1989) 287



- Ricci, M.A., see V. Mazzacurati 159 (1989) 383
- Ricciardi, G.P., see F. Leij 160 (1989) 39
- Richard, E.C., D.J. Donaldson and V. Vaida, Fourier transform UV/VIS emission spectroscopy of jet-cooled CN( $B^2\Sigma^+$ ) 157 (1989) 295
- Richter, W., Th. Sesselmann and D. Haarer, Spectral diffusion caused by IR irradiation into hole-burning spectra of dye molecules in polymer matrices 159 (1989) 235
- Ries, P.D. and C.J. Eckhardt, Observation of the H band in the crystal spectrum of 4-[4,4-bis[(trifluoromethyl)sulfonyl]-1,3-butadienyl]-N,N-dimethylbenzeneamine (FSMB) 153 (1988) 223
- Riesen, H., E. Krausz and M. Puza, Zero-phonon lines and luminescence line narrowing in the series Ru(bpy- $d_8$ ) $_x$ (bpy) $_{3-x}$ (PF $_6$ ) $_2$  ( $x=1-3$ ). Direct evidence for localization in the two lowest excited states 151 (1988) 65
- Riesen, H. and E. Krausz, Magnetic circularly polarized luminescence of the sharp zero-phonon lines in Ru(bpy) $_3$ (PF $_6$ ) $_2$  151 (1988) 71
- Riggi, F., see R.P. Bonomo 151 (1988) 208
- Righini, R., see L. Angeloni 154 (1989) 115, 432
- Riley, M., see L. Dubicki 157 (1989) 315
- Rinnen, K.-D., see R.S. Blake 153 (1988) 365
- Rinnen, K.-D., D.A.V. Kliner, R.S. Blake and R.N. Zare, The H+D $_2$  reaction: "prompt" HD distributions at high collision energies 153 (1988) 371
- Rittby, M., see S. Pal 160 (1989) 212
- Rivail, J.L., see C. Millot 160 (1989) 228
- Rizzo, A., see I. Cacelli 155 (1989) 210
- Robb, M.A., see F. Bernardi 153 (1988) 309
- Robert, J., see P. Feron 160 (1989) 555
- Robinson, B.H., see P.J. Atkinson 151 (1988) 494
- Robinson, E.J., A note on the two-photon dissociation of HD $^+$  158 (1989) 405
- Robinson, G.W., see S.-B. Zhu 153 (1988) 539
- Robota, H.J., see S.B. Mohsin 154 (1989) 511
- Rocco, M.L.M., R. Dudde, K.-H. Frank and E.-E. Koch, Angle-resolved photoemission from uracil and thymine adsorbed on Cu(110) 160 (1989) 366
- Rode, B.M., see M.G. Schwendinger 155 (1989) 527
- Røeggen, I. and E. Wisløff Nilssen, Prediction of a metastable D $_{3h}$  form of tetra oxygen 157 (1989) 409
- Roehl, C.M., see J.T. Snodgrass 159 (1989) 10
- Rohmer, M.-M., Photochemical cleavage of the metal-carbon bond in aluminium porphyrins: insights from ab initio calculations 157 (1989) 207
- Roncin, J., see L. Bonazzola 153 (1988) 52
- Roos, B.O., see P.-Å. Malmqvist 155 (1989) 189
- Ros, M. and E.J.J. Groenen, The triplet state of dodecapentaenal: electron spin echo spectroscopy of a polyenal 154 (1989) 29
- Rosa, A., see F. Leij 160 (1989) 39
- Rösch, N., see J. Fessmann 152 (1988) 491
- Rösch, N., see M. Kotzian 160 (1989) 168
- Rose, J.L., see C. Samet 159 (1989) 567
- Rosi, M. and C.W. Bauschlicher Jr., On the binding energy of He $_n^+$ , for  $n=2-7$  159 (1989) 479
- Rosi, M., see C.W. Bauschlicher Jr. 159 (1989) 485
- Ross, A.J., H.A. Hollenstein, R.R. Marquardt and M. Quack, Fermi resonance in the overtone spectra of the CH chromophore in bromoform 156 (1989) 455
- Rossi, C. and N. Niccolai, Determination of proton-carbon cross-relaxation from selective proton-carbon spin-lattice relaxation rates and heteronuclear transient NOE 156 (1989) 438

Rostas, F., see N. Shafizadeh	152 (1988) 75
Rostas, F., see R.G. Briggs	156 (1989) 363
Rostas, J., see N. Shafizadeh	152 (1988) 75
Rostas, J., see R.G. Briggs	156 (1989) 363
Roszak, S., see W.A. Sokalski	153 (1988) 153
Rothenberger, G. and M. Grätzel, Effects of spatial confinement on the rate of bimolecular reactions in organized liquid media	154 (1989) 165
Rotman, S.R. and F.X. Hartmann, Non-radiative energy transfer in non-uniform codoped laser crystals	152 (1988) 311
Roubin, P., R. Kakou, P. Verlaque, M. Monnier, J. Pourcin and H. Bodot, IR photoinduced isomerization of CH <sub>2</sub> DCH <sub>2</sub> D isolated in a xenon matrix	160 (1989) 345
Rousseau, B., see I. Palchan	157 (1989) 321
Royen, P., see L.-E. Berg	159 (1989) 175
Rozenstein, V.B., see M.A. Ioffe	154 (1989) 131
Rubim, J.C., see S.A. Bilmes	159 (1989) 89
Ruderman, G., see J.R. Grigera	156 (1989) 615
Ruf, M.-W., see A. Merz	160 (1989) 377
Rühl, E., B. Brutschy and H. Baumgärtel, Autoionization resonances in homogeneous benzene clusters	157 (1989) 379
Ruhman, S., see B. Hartke	158 (1989) 238
Ruiz-Hernandez, D., see J. Albaladejo	152 (1988) 519
Rumbles, G., see A.J. Brown	151 (1988) 247
Ruocco, G., see V. Mazzacurati	159 (1989) 383
Russell, D.K., see P.B. Davies	156 (1989) 553
Russo, M.V., A. Furlani, I. Davoli and A. Bianconi, XANES studies of bis-1-oxopyridine-2-thiolato Pt(II) complexes	155 (1989) 599
Ruttink, P.J.A., see R. Postma	156 (1989) 245
Ruttink, P.J.A., see C.E.C.A. Hop	156 (1989) 251
Ryabov, V.M., Reaction path Hamiltonian for the gas-phase S <sub>N</sub> 2 nucleophilic substitution reaction	159 (1989) 371
Rybka, V., see V. Švorčík	157 (1989) 390
Rychlewski, J., The e <sup>3</sup> Σ <sub>u</sub> <sup>+</sup> state of the H <sub>2</sub> molecule	151 (1988) 553

- Saalfrank, P., P. Otto and J. Ladik, Studies on the electronic structure of trigonal selenium and tellurium using the effective core potential approximation 153 (1988) 451
- Sabbatini, N., see G. Blasse 158 (1989) 504
- Sadeghi, N., see R. Sobczynski 154 (1989) 349
- Sadeghi, N., see P. Baltayan 160 (1989) 549
- Sadlej, A.J., see V. Kellö 152 (1988) 387
- Sadlej, A.J., see G.H.F. Diercksen 153 (1988) 93; 155 (1989) 127; 156 (1989) 269
- Sæbø, S. and J. Almlöf, Avoiding the integral storage bottleneck in LCAO calculations of electron correlation 154 (1989) 83
- Sağat, L., see F. Bayrakçeken 159 (1989) 109
- Sagdeev, R.Z., see N.I. Avdievich 155 (1989) 141
- Saigusa, H., Chemiluminescence detection of a phase response to an oxygen perturbation in the Ru(bpy)<sub>3</sub><sup>2+</sup> catalyzed Belousov-Zhabotinskii reaction 157 (1989) 251
- Saile, V., see R. Reininger 159 (1989) 276
- Saito, M. and H. Kashiwagi, An ab initio MO study on the structure dependence of Mössbauer spectra in iron porphyrin complexes 155 (1989) 557
- Saito, S., see S. Takano 159 (1989) 563
- Sakai, T., see H. Ikeda 157 (1989) 576
- Sakuragi, H., see T. Arai 157 (1989) 46; 158 (1989) 429
- Salahub, D.R., see M. Morin 159 (1989) 472
- Salem, L., G. Berthier, J.-M. Lefour and T. Koga, Overlap revisited 160 (1989) 67
- Salin, A., see F. Martín 157 (1989) 146
- Salter, E.A., see G.W. Trucks 153 (1988) 490
- Salvi, P.R., see R. Bini 151 (1988) 236
- Salvi, P.R., see L. Angeloni 154 (1989) 432
- Samanta, A. and R.W. Fessenden, On the triplet lifetime and triplet-triplet absorption spectra of naphthaldehydes 153 (1988) 406
- Samet, C., J.L. Rose, P.N. Schatz and M.C.M. O'Brien, Magnetic circular dichroism and the Jahn-Teller effect in the potassium atom "blue triplet" in krypton and xenon matrices 159 (1989) 567
- Sampoli, M., see V. Mazzacurati 159 (1989) 383
- Samuel, L.M., P.N. Sanda and R.D. Miller, Thermally stimulated current studies of charge transport in a  $\sigma$ -conjugated polymer 159 (1989) 227
- San Biagio, P.L., J. Newman, F. Madonia and M.U. Palma, Co-solute control of the self-assembly of a biopolymeric supramolecular structure 154 (1989) 477
- Sanche, L., see R. Azria 156 (1989) 606
- Sanchez, E., see P.S. Shaw 151 (1988) 449
- Sanda, P.N., see L.M. Samuel 159 (1989) 227
- Sander, S.P., see A. Wahner 152 (1988) 507
- Sanders, G.M., see U. Hofstra 151 (1988) 169
- Sando, K.M., see G. Pichler 156 (1989) 467
- Santamaria, J., see R.M. Benito 155 (1989) 391
- Sapse, A.-M. and K. Raghavachari, Lithium bond: H<sub>3</sub>N—LiOH and H<sub>2</sub>O—LiNH<sub>2</sub> complexes and their interconversions 158 (1989) 213
- Sarkar, B. and K. Bhattacharyya, On the Padé method for sequence acceleration and calculation of Madelung constants, Chem. Phys. Letters 150 (1988) 419. Erratum 153 (1988) 583
- Sarkisov, O.M., see V.P. Bulatov 153 (1988) 258; 159 (1989) 171
- Sarkisov, O.M., see S.G. Cheskis 155 (1989) 37

- Sarkisov, O.M., see A.A. Ioffe 156 (1989) 425
- Sarma, C.R., see S. Zarrabian 155 (1989) 183
- Sarv, P., see J. Haase 152 (1988) 254; 156 (1989) 328
- Sass, C.S., see F. Masson 152 (1988) 325
- Sathyamurthy, N., see K.C. Bhalla 160 (1989) 437
- Sato, H. and K. Kasatani, Magnetic field effects on the photochromism of hexaphenylbiimidazolyl 151 (1988) 97
- Sato, H., see T. Matsushima 157 (1989) 55
- Sato, K., see Y. Inoue 160 (1989) 118
- Sato, S., see H. Umemoto 153 (1988) 233
- Sato, S., see T. Noguchi 155 (1989) 177
- Sato, S., see K. Nakamura 160 (1989) 295
- Sato, T., see Y. Matsumi 155 (1989) 486
- Sato, Y., see K. Ueda 154 (1989) 357
- Sato, Y., see S. Nagaoka 154 (1989) 363
- Sato, Y., see H. Tanuma 159 (1989) 442
- Sauer, J., see G. Scholz 156 (1989) 125
- Saunders, W.A. and S. Fedrigo, Fission of small multiply charged gold clusters 156 (1989) 14
- Sautet, P. and C. Joachim, Electronic interference produced by a benzene embedded in a polyacetylene chain 153 (1988) 511
- Savelli, G., see B. Focher 158 (1989) 491
- Savić, P., see V. Urošević 155 (1989) 325
- Savin, A., see B. Miehlich 157 (1989) 200
- Šavrdá, J., see J. Vojtík 157 (1989) 337
- Saxon, R.P., see D. Talbi 157 (1989) 419
- Saykally, R.J., see M.B. Radunsky 152 (1988) 419
- Scaiano, J.C., see C. Bohne 152 (1988) 156
- Scaiano, J.C., see J.P. Fouassier 160 (1989) 335
- Sceats, M.G., Vibrational deactivation of a highly excited diatomic - a stochastic approach 151 (1988) 281
- Schaafsma, T.J., see U. Hofstra 151 (1988) 169
- Schaal, B., see W.E. Ernst 155 (1989) 47
- Schaefer III, H.F., see G.E. Scuseria 152 (1988) 382
- Schaefer III, H.F., see B.F. Yates 155 (1989) 563
- Schaefer III, H.F., see C. Liang 159 (1989) 393
- Schäfer, H., see J. Haase 156 (1989) 328
- Schaftenaar, G., see C.E.C.A. Hop 156 (1989) 251
- Schatz, G.C., Oscillating reactivity and resonances in the three-dimensional Cl+HCl reaction 151 (1988) 409
- Schatz, P.N., see C. Samet 159 (1989) 567
- Schechter, I. and R.D. Levine, The K + oriented CH<sub>3</sub>I reaction: the correlation between reagents' orientation and products' angular distribution 153 (1988) 527
- Scheek, R.M., see A.E. Torda 157 (1989) 289
- Scheer, H., see W. Holzapfel 160 (1989) 1
- Schein, L.B., see A. Peled 153 (1988) 422
- Scheraga, H.A., see Z. Li 154 (1989) 516; 157 (1989) 579
- Schettino, V., see L. Angeloni 154 (1989) 432
- Schiffman, A., see D.D. Nelson Jr. 153 (1988) 105

Schiller, W.S. and M.A. Spackman, Harmonic intermolecular vibrational frequencies for hydrogen-bonded dimers using a simple model	151 (1988) 547
Schinke, R., see K. Kühl	158 (1989) 81
Schlachter, A.S., see G.C. Stutzin	155 (1989) 475
Schlag, E.W., see G. Reiser	152 (1988) 119
Schlag, E.W., see K. Walter	155 (1989) 8
Schlyer, B.D., A.H. Maki and A.J.W.G. Visser, An ODMR study of amphiphilic flavins in a Shpol'skii matrix	154 (1989) 39
Schmickler, W., see E. Leiva	160 (1989) 75
Schmidt, A. and S. Vega, Dynamic off-magic angle-sample spinning NMR spectroscopy	157 (1989) 539
Schmidt, J., see A.P.J.M. Jongenelis	152 (1988) 497
Schmidt, P.P., Gaussian expansions of anharmonic potentials for vibrational analyses	159 (1989) 511
Schmidt, R., Determination of the phosphorescence quantum yield of singlet molecular oxygen ( $^1\Delta_g$ ) by means of a radiometer and an infrared luminescence spectrometer	151 (1988) 369
Schmidt, R., see A. Völcker	159 (1989) 103
Schmidt, R., see K. Jesse	160 (1989) 8
Schmitz, B., see H. Zuckermann	151 (1988) 323
Schneider, R. and W. Domcke, Surface-hopping-induced femtosecond vibrational dephasing in strongly vibronically coupled systems	159 (1989) 61
Schneider, W. and W. Thiel, Anharmonic force fields from analytic second derivatives: method and application to methyl bromide	157 (1989) 367
Schnöckel, H., see R. Ahlrichs	154 (1989) 104
Schnörer, H., A. Blumen, J. Singh and A. Thilagam, Long-time depolarization decay due to excitation transport	160 (1989) 80
Scholz, G., J. Sauer and D.-H. Menz, The HF-AlF <sub>3</sub> gas-phase complex: an ab initio molecular orbital study	156 (1989) 125
Schönherr, T., J. Degen, E. Gallhuber, G. Hensler and H. Yersin, Geometrical distortions in excited A <sub>2</sub> ' states of single-crystal [Ru(bpy) <sub>3</sub> ](PF <sub>6</sub> ) <sub>2</sub>	158 (1989) 519
Schor, H.H.R., see R.A. Fischer	156 (1989) 100
Schramm, B., see J. Kern	154 (1989) 292
Schröder, J.O., see W.E. Ernst	155 (1989) 47
Schueler, B., see J. Morton	154 (1989) 143
Schug, J.C., see F.A. Senese	160 (1989) 423
Schuler, R.H., see G.N.R. Tripathi	156 (1989) 51
Schulman, J.M., see R.L. Disch	152 (1988) 402
Schurath, U., see A.C. Becker	160 (1989) 586
Schwahn, H., see J. Kern	154 (1989) 292
Schwarz, H., see K. Eller	154 (1989) 443
Schwarz, H., see D. Sülzle	156 (1989) 397
Schwarz, W.H.E. and H.E. Mons, Electron deformation densities compatible with chemical binding	156 (1989) 275
Schwarzwald, R., P. Monkhouse and J. Wolfrum, Fluorescence lifetimes for nitric oxide in atmospheric pressure flames using picosecond excitation	158 (1989) 60
Schweiger, A., see S. Pfenninger	151 (1988) 199
Schweiger, A., see C. Bühlmann	154 (1989) 285
Schweiger, A., see H. Cho	160 (1989) 391
Schweizer, E., see D. Hoge	151 (1988) 230

- Schwendinger, M.G. and B.M. Rode, A Monte Carlo simulation of a supersaturated sodium chloride solution 155 (1989) 527
- Schwenke, D.W., see M. Zhao 156 (1989) 281
- Schwenke, D.W., see C. Yu 157 (1989) 491
- Schwentner, N., see I. Gersonde 153 (1988) 273
- Schwentner, N., M.E. Fajardo and V.A. Apkarian, Rydberg series of charge transfer excitations in halogen-doped rare gas crystals 154 (1989) 237
- Schwentner, N. and V.A. Apkarian, A solid state rare gas halide laser: XeF in crystalline argon 154 (1989) 413
- Sciortino, F., K.U. Prasad, D.W. Urry and M.U. Palma, Spontaneous concentration fluctuations initiate bioelastogenesis 153 (1988) 557
- Scotoni, M., M. Zen, D. Bassi, A. Boschetti and M. Ebben, An opto-thermal study of NH<sub>3</sub> rotational relaxation in NH<sub>3</sub>-He supersonic expansions 155 (1989) 233
- Scotoni, M., see A. Boschetti 158 (1989) 1
- Scott, C.A., see S.F.J. Cox 160 (1989) 85
- Scuseria, G.E. and H.F. Schaefer III, A new implementation of the full CCSDT model for molecular electronic structure 152 (1988) 382
- Sears, T.J., see G.E. Hall 158 (1989) 184
- Sears, T.J., see F.J. Northrup 159 (1989) 421
- Sebald, P., see P. Botschwina 160 (1989) 485
- Segal, G.A., see Y.Y. Bai 151 (1988) 31
- Seiffert, B., see J. Haase 156 (1989) 328
- Seki, H., see A. Takematsu 159 (1989) 282
- Sekino, H., see Y. Ishikawa 160 (1989) 206
- Sekiya, H., Y. Nagashima and Y. Nishimura, Electronic spectra of jet-cooled tropolone (-OD). Vibrational analysis for the  $\tilde{A}^1B_2-\tilde{X}^1A_1$  transition 160 (1989) 581
- Selinger, A., see M.P. Irion 158 (1989) 145
- Seminario, J.M., see P. Politzer 158 (1989) 463
- Seminario, J.M. and P. Politzer, Analysis of different computational treatments of highly strained molecules 159 (1989) 27
- Sen, K.D. and A. Puri, Relativistic local spin density functional calculations of dipole oscillator strengths in alkaline earth isoelectronic series 156 (1989) 505
- Senese, F.A., C.A. Beattie, J.C. Schug, J.W. Viers and L.T. Watson, A full variational calculation based on a tensor product decomposition 160 (1989) 423
- Senn, P., Comment on the bound states of the Schrödinger equation with the potential  $V = A/x^2 + Bx^2$  154 (1989) 172
- Sensharma, D.K., see H.J. Hwang 160 (1989) 243
- Serebrennikov, Yu.A. and M.I. Majitov, Spin-lattice relaxation in zero-magnetic field induced by molecular reorientations 157 (1989) 462
- Sesselmann, Th., see W. Richter 159 (1989) 235
- Sessler, J.L., see A. Regev 160 (1989) 401
- Setser, D.W., see K.-Y. Du 153 (1988) 393
- Setser, D.W., see R. Sobczynski 154 (1989) 349
- Severcan, F. and S. Cannistraro, Use of PDDTBN spin probe in partition studies of lipid membranes 153 (1988) 263
- Shafizadeh, N., J. Rostas, J.L. Lemaire and F. Rostas, Photodissociation of H<sub>2</sub>O in the "second continuum" 152 (1988) 75



Shafizadeh, N., see R.G. Briggs	156 (1989) 363
Shah, M., see I.R. Politzer	159 (1989) 258
Shan, J.H., S.J. Wategaonkar and R. Vasudev, Vibrational state dependence of the $\tilde{A}$ state lifetime of HONO	158 (1989) 317
Shan, J.H., S.J. Wategaonkar and R. Vasudev, State-selected dissociation of cis-HONO( $\tilde{A}^1A''$ ): effect of intramolecular hydrogen bonding	160 (1989) 614
Shank, C.V., see H.L. Fragnito	160 (1989) 101
Sharpe, S. and P.M. Johnson, A multiphoton spectrum of the Rydberg region of CCl	155 (1989) 262
Sharpe, S.W., R. Sheeks, C. Wittig and R.A. Beaudet, Infrared absorption spectroscopy of CO <sub>2</sub> -Ar complexes	151 (1988) 267
Shaw, P.S., E. Sanchez, Z. Wu and R.M. Osgood Jr., A UV spectroscopic study of DMZn and DMCd chemisorbed on quartz surfaces	151 (1988) 449
Shchuka, M.I., see S.A. Wittmeyer	151 (1988) 384
Sheehy, J.A., see K.T. Leung	157 (1989) 135
Sheeks, R., see S.W. Sharpe	151 (1988) 267
Shelley, J.C., R.J. Le Roy and F.G. Amar, Two- versus three-dimensional melting and spontaneous reversing isomerization in isolated SF <sub>6</sub> -(Ar) <sub>n</sub> van der Waals clusters	152 (1988) 14
Shen, J. and R.D. Snook, Thermal lens measurement of absolute quantum yields using quenched fluorescent samples as references	155 (1989) 583
Shen, L., R.B. Gerber and M.A. Ratner, Static mean-field theory for molecular vibrations: self-consistent correlation corrections	155 (1989) 119
Shen, Y.R., see X.D. Zhu	155 (1989) 459
Shetter, R.E., see C.A. Cantrell	152 (1988) 274
Shibuya, K., T. Kusumoto, H. Nagai and K. Obi, Rovibronic levels of NO <sub>2</sub> excited at 514 nm and probed by an optical-optical double-resonance method	152 (1988) 129
Shigemasa, E., see K. Ueda	154 (1989) 357
Shigemasa, E., see S. Nagaoka	154 (1989) 363
Shimada, T., H. Suzuki, T. Nishi, K. Arishima and H. Hiratsuka, Photochemical hole-burning in highly doped reduced porphyrins/poly- <i>p</i> -xylylene systems	158 (1989) 435
Shimizu, Y., see T. Nogami	155 (1989) 338
Shimo, N., N. Nakashima and K. Yoshihara, Laser-ignited explosive decomposition of organometallic compounds	156 (1989) 31
Shimomura, M., see S. Kirstein	154 (1989) 303
Shin, H.K., Intramolecular dynamics of energy flow between van der Waals bonds in a collisionally excited Ar...N≡N...Ar	156 (1989) 536
Shin, K.S., see N. Fujii	151 (1988) 461
Shin, Y.-D. and E.C. Lim, Rotational invariance of the fluorescence quantum yield in S <sub>1</sub> pyridine	151 (1988) 308
Shindo, H., Raman spectra of acrylonitrile adsorbed on a silver electrode	159 (1989) 85
Shinohara, H., N. Nishi and N. Washida, Experimental evidence of the magic number stability of the hydrated ammonia cluster ions (H <sub>2</sub> O)(NH <sub>3</sub> ) <sub>0-4</sub> NH <sub>4</sub> <sup>+</sup>	153 (1988) 417
Shioya, Y., M. Yagi and J. Higuchi, A time-resolved electron spin resonance study of the triplet states of 1-nitronaphthalene and 1,4-dinitronaphthalene	154 (1989) 25
Shirai, H., see M. Yagi	160 (1989) 13
Shirley, D.A., see L. Wang	158 (1989) 297
Shirley, W.A., see G.A. Petersson	160 (1989) 494
Shirota, Y., see T. Nogami	155 (1989) 338

- Shizuka, H., see A.K. Mishra 151 (1988) 379
- Shizuka, H., see H. Hiratsuka 157 (1989) 35
- Shizuka, H., see H. Kobashi 160 (1989) 261
- Shobatake, K., see S. Hirayama 153 (1988) 112
- Shobatake, K., see I. Tokue 153 (1988) 346
- Shobatake, K., see T. Ibuki 157 (1989) 521; 160 (1989) 152
- Shukla, A., see J. Biggerstaff 151 (1988) 507
- Sidebottom, D.L. and C.M. Sorensen, Comparison of field variables for critical phenomena description 151 (1988) 489
- Sidebottom, H.W., see O.J. Nielsen 156 (1989) 312
- Sidhu, S.S., see J.H. Kiefer 159 (1989) 32
- Siebrand, W., see P.-N. Wang 159 (1989) 7
- Siegbahn, P., see I. Panas 153 (1988) 458
- Siemiarzuk, A. and W.R. Ware, A novel approach to analysis of pyrene fluorescence decays in sodium dodecylsulfate micelles in the presence of  $\text{Cu}^{2+}$  ions based on the maximum entropy method 160 (1989) 285
- Sievers, A.J., see S.P. Love 153 (1988) 379
- Silverman, J.N. and C.A. Nicolaides, Complex Stark eigenvalues via analytic continuation of real high-order perturbation series 153 (1988) 61
- Silverman, J.N., Accurate eigenvalues of three- through ten-electron atomic isoelectronic sequences from low-order Z-dependent perturbation theory combined with variational constraints and screening 160 (1989) 514
- Simandiras, E.D., see P. Valtazanos 156 (1989) 240
- Simon, J., see R. Even 156 (1989) 609
- Simon, J.D., see S.-G. Su 158 (1989) 423
- Simpson, N.J.K., see K.A. McLauchlan 154 (1989) 550
- Simpson, V., see P. Pagsberg 157 (1989) 271
- Sims, I.R. and I.W.M. Smith, Rate constants for the radical-radical reaction between CN and  $\text{O}_2$  at temperatures down to 99 K 151 (1988) 481
- Singer, L.A., see J.C.-C. Tseng 153 (1988) 401
- Singh, J., see H. Schnörrer 160 (1989) 80
- Singh, N.K. and R.G. Jones, A surface phase transition driven by the density of states at the Fermi level 155 (1989) 463
- Sinha, D., S.K. Mukhopadhyay, R. Chaudhuri and D. Mukherjee, The eigenvalue-independent partitioning technique in Fock space: an alternative route to open-shell coupled-cluster theory for incomplete model spaces 154 (1989) 544
- Sinou, G., see A. Le Nadan 156 (1989) 24
- Sipior, J., see C.K. Teh 158 (1989) 351
- Sizun, M., see E.A. Gislason 158 (1989) 102
- Sjöqvist, L., M. Lindgren and A. Lund, Internal motion of the cyclopentyl radical in  $\text{CF}_2\text{ClCFCl}_2$ : an ESR investigation 156 (1989) 323
- Skoulios, A., see P. Maldivi 157 (1989) 552
- Ślęzak, A., see J. Lech 157 (1989) 175
- Slade, R.C.T., see H.A. Pressman 151 (1988) 354
- Slade, R.C.T., P.R. Hirst, B.C. West, R.C. Ward and A. Magerl, Quasielastic neutron scattering investigation of motional processes associated with two dynamic hydrogen populations in the bronze  $\text{H}_{1.68}\text{MoO}_3$  155 (1989) 305

Slanina, Z., HF-ClF isomeric system revisited and revised	160 (1989) 219
Small, G.J., see S.G. Johnson	155 (1989) 371
Smalley, R.E., see K.J. Taylor	152 (1988) 347
Smirnov, V.V., see V.I. Fabelinsky	156 (1989) 159
Smit, K.J., J.M. Warman, M.P. de Haas, M.N. Paddon-Row and A.M. Oliver, Charge recombination kinetics of giant dipoles in saturated hydrocarbon solvents	152 (1988) 177
Smit, W.M.A., see H. Donker	158 (1989) 509
Smith, G.P., see J.B. Jeffries	152 (1988) 160
Smith, I.W.M., see I.R. Sims	151 (1988) 481
Smith, K.A., see C.W. Walter	154 (1989) 409
Smotkin, E.S., C. Lee, A.J. Bard, A. Campion, M.A. Fox, T.E. Mallouk, S.E. Webber and J.M. White, Size quantization effects in cadmium sulfide layers formed by a Langmuir-Blodgett technique	152 (1988) 265
Snider, N., Sum rules in the theory of vibrational relaxation and unimolecular reactions	160 (1989) 45
Snijders, J.G., see B.T. Pickup	153 (1988) 69
Snodgrass, J.T., C.M. Roehl and M.T. Bowers, Photodissociation dynamics of Ar <sub>3</sub> <sup>+</sup>	159 (1989) 10
Snook, R.D., see J. Shen	155 (1989) 583
So, H.Y., see M.S. Ahmed	151 (1988) 128
Sobczynski, R., R. Beaman, D.W. Setser and N. Sadeghi, Generation of Kr( <sup>3</sup> P <sub>0</sub> ) atoms in a flow reactor: reactions with CO, N <sub>2</sub> , NF <sub>3</sub> and F <sub>2</sub>	154 (1989) 349
Sobolewski, A.L., Influence of totally symmetric vibrational modes on near-threshold autoionization spectra of polyatomic molecules	153 (1988) 191
Sokalski, W.A., S. Roszak and K. Pecul, An efficient procedure for decomposition of the SCF interaction energy into components with reduced basis set dependence	153 (1988) 153
Sokolik, A.I., see E.L. Frankevich	159 (1989) 113
Solgadi, D., see C. Jouvét	156 (1989) 569
Solodukhin, A.S., V.S. Starovoitov, S.A. Trushin and V.V. Churakov, Measurement of the deactivation rate of asymmetric vibrations in <sup>12</sup> CO <sub>2</sub> - <sup>13</sup> CO <sub>2</sub> mixtures	158 (1989) 70
Solovyov, M.Ye., see A.B. Raukhvargher	155 (1989) 455
Sondag, A.H.M., M.C. Raas and P.N.T. van Velzen, Contamination of aluminium oxide surfaces in ambient air investigated by FTIR MSR and TOF SIMS. Chemisorption of aliphatic carboxylic acids	155 (1989) 503
Sone, Y., see S. Nonose	158 (1989) 152
Song, L. and M.A. El-Sayed, Bromine abstraction versus dehydrogenation in the reaction of gaseous niobium clusters with saturated and unsaturated organic bromides	152 (1988) 281
Song, T., see X. Wang	157 (1989) 87
Sonnich Mortensen, O., see M. Pawlikowski	158 (1989) 289
Soos, Z.G., see S. Ramasesha	153 (1988) 171
Sorensen, C.M., see D.L. Sidebottom	151 (1988) 489
Sorriso, S., see E. Jakusek	153 (1988) 341
Sosa, C., J. Noga, G.D. Purvis III and R.J. Bartlett, An application of the full CCSDT coupled-cluster method to potential energy curves: the CH <sub>4</sub> →CH <sub>3</sub> +H dissociation	153 (1988) 139
Sosa, C., J. Geertsen, G.W. Trucks, R.J. Bartlett and J.A. Franz, Selection of the reduced virtual space for correlated calculations. An application to the energy and dipole moment of H <sub>2</sub> O	159 (1989) 148
Sotnichenko, S.A., V.Ch. Bokun and A.I. Nadkhin, Collisional quenching of chlorine (3 <sup>2</sup> P <sub>1/2</sub> ) by H <sub>2</sub> , D <sub>2</sub> , CO, O <sub>2</sub> , N <sub>2</sub> and CO <sub>2</sub>	153 (1988) 560

Sowinska, M., see J.-P. Launay	160 (1989) 89
Spackman, M.A., see W.S. Schiller	151 (1988) 547
Speer, R., see J. Ullrich	155 (1989) 363
Speranza, G., see P. Manitto	159 (1989) 310
Špirko, V., see J. Vojtlík	157 (1989) 337
Spotswood, M., see D.W. Noid	154 (1989) 391
Springuel-Huet, M.A. and J. Fraissard, $^{129}\text{Xe}$ NMR of xenon adsorbed on the molecular sieves $\text{AlPO}_4\text{-11}$ and $\text{SAPO-11}$ . Chemical shift anisotropy related to the asymmetry of the adsorption zones	154 (1989) 299
Springuel-Huet, M.A., see Q.J. Chen	159 (1989) 117
Spruit, M.E.M. and A.W. Kleyn, Dissociative adsorption of $\text{O}_2$ on $\text{Ag}(111)$	159 (1989) 342
Sreekanth, C.S., see T. Pradeep	151 (1988) 499
Srivastava, S.K., see D.P. Wang	152 (1988) 513
Stace, A.J., see A.J. Marks	154 (1989) 492
Stace, A.J., see C.A. Woodward	158 (1989) 417
Staerk, H., H.-G. Busmann, W. Kühnle and A. Weller, Solvent effects on the magnetic-field-dependent reaction yields of photogenerated radical ion pairs	155 (1989) 603
Stamatovic, A., F. Howorka and T.D. Märk, Apparent photodestruction of a neutral $\text{Ar}_n$ cluster beam with visible laser light	160 (1989) 29
Stankiewicz, M., see P.A. Hatherly	159 (1989) 355
Stapelfeldt, J., see J. Wörmer	159 (1989) 321
Starovoitov, V.S., see A.S. Solodukhin	158 (1989) 70
Stegeman, G.I., see V. Mizrahi	156 (1989) 392
Stegemeyer, H., see F. Porsch	155 (1989) 620
Steimle, T.C., W.-L. Chang and D.F. Nachman, $\Delta$ -doubling transitions of metal oxides measured by microwave-optical double resonance: $\text{CuO}$	153 (1988) 534
Stepanov, E.V., see A.V. Eletskii	153 (1988) 313
Stephens, P.J., K.J. Jalkanen, P. Lazzeretti and R. Zanasi, Calculation of paramagnetic susceptibilities using electronic atomic axial tensors (or nuclear shielding tensors) and the distributed origin gauge: ethylene oxide	156 (1989) 509
Stephenson, T.A., Y. Hong and M.I. Lester, Nonadiabatic transitions in the dynamics of the $\text{NeICl}$ van der Waals complex	159 (1989) 549
Sterk, H., see R. Konrat	159 (1989) 137
Stevens, A.D., see M.C.R. Symons	160 (1989) 386
Stevenson, S.H., see W. Tam	154 (1989) 93
Stilz, H.U., see W. Holzapfel	160 (1989) 1
Stob, S., see A.V. Podoplelov	160 (1989) 233
Stoicheff, B.P., see A. Balakrishnan	155 (1989) 43
Stoll, H., see B. Miehlich	157 (1989) 200
Stone, A.J., The induction energy of an assembly of polarizable molecules	155 (1989) 102
Stone, A.J., Assessment of multipolar approximations to the induction energy	155 (1989) 111
Stout, J.E., B.K. Andrews, T.J. Bevilacqua and R.B. Weisman, CARS observation of fine structure population inversion from atomic quenching: $\text{S}(^1\text{D}) + \text{Ar} \rightarrow \text{S}(^3\text{P}_0) + \text{Ar}$	151 (1988) 156
Stręk, W. and J. Sztucki, Radiationless transitions in lanthanide(III) complexes. Effect of ligand anisotropy	158 (1989) 301
Stranger, R., On the assignment of doubly excited pair transitions in the electronic spectrum of $\text{Cs}_3\text{Mo}_2\text{Cl}_9$	157 (1989) 472

Stranges, D., see V. Di Napoli	154 (1989) 217
Stroh, F. and M. Winnewisser, Isocyanogen, CNCN: infrared and microwave spectra and structure	155 (1989) 21
Stroh, F., B.P. Winnewisser, M. Winnewisser, H.P. Reisenauer, G. Maier, S.J. Goede and F. Bickelhaupt, Matrix-isolation infrared investigation of the flash vacuum thermolysis of norbornadienone azine	160 (1989) 105
Stuchebrukhov, A.A., On the spectroscopy of adsorbed atoms: quasiharmonic approximation for the adbond	158 (1989) 274
Studer, S.L., see W.E. Brewer	158 (1989) 345
Stuhl, F., see R.D. Kenner	156 (1989) 305
Stutzin, G.C., A.T. Young, A.S. Schlachter, K.N. Leung and W.B. Kunkel, In situ measurement of rovibrational populations of H <sub>2</sub> ground electronic state in a plasma by VUV laser absorption	155 (1989) 475
Stwalley, W.C., see G. Pichler	156 (1989) 467
Su, S.-G. and J.D. Simon, Nonequilibrium and nonadiabatic effects on excited state electron transfer reactions in solution	158 (1989) 423
Subbi, J., T. Reinot and J. Aaviksoo, Vibronic interactions and normal coordinate rotation in quinizarin	159 (1989) 292
Suckley, A.P., see A.C. Legon	157 (1989) 5
Sueishi, Y. and K. Kuwata, Time-resolved ESR study of the pressure effects on photoreduction of 2,4,6-trinitrobenzoic acid	151 (1988) 439
Sueishi, Y. and K. Kuwata, Pressure effects on the electron spin relaxation of several radicals in solution	160 (1989) 640
Sueoka, K., see H. Uehara	160 (1989) 149
Suffolk, R.J., see A.W. Allaf	155 (1989) 32
Sugawara, K., T. Nakanaga, H. Takeo and C. Matsumura, Rate constant measurements for reactions of SiH <sub>3</sub> with O <sub>2</sub> , NO and NO <sub>2</sub> using time-resolved infrared diode laser spectroscopy	157 (1989) 309
Sugita, K., see S. Arai	151 (1988) 516
Suhm, M.A. and H. Weingärtner, Anisotropic molecular reorientation of hexafluorobenzene in binary liquid mixtures with benzene and cyclohexane. A nuclear magnetic relaxation study	159 (1989) 193
Suijker, J.L.G., see P. Van de Weijer	153 (1988) 33
Sukhorukov, V.L., see B.M. Lagutin	160 (1989) 432
Sulkes, M., see C.K. Teh	158 (1989) 351
Sullivan, N.S. and Y. Lin, Relaxation and large-scale excitations in the orientational glass state of solid H <sub>2</sub>	156 (1989) 218
Sultan, G., see G. Baravian	159 (1989) 361
Sülzle, D., see K. Eller	154 (1989) 443
Sülzle, D. and H. Schwarz, The generation and identification of triplet vinylidene, [H <sub>2</sub> C=C:], by neutralization-reionization mass spectrometry	156 (1989) 397
Sumpter, B.G. and D.L. Thompson, Influence of rotation on the intramolecular dynamics of hydrogen peroxide	153 (1988) 243
Sun, G., X. Ni, T. Butz and A. Lerf, Nuclear quadrupole interaction of <sup>99</sup> Mo(β <sup>-</sup> ) <sup>99</sup> Tc in Mo(V; VI)-cysteine complexes	151 (1988) 54
Sun, K., see C. Wan	152 (1988) 100
Sun, Q., see G.N.R. Tripathi	156 (1989) 51

Sun, Y., see M. Zhao	156 (1989) 281
Suryaprakash, N., see P. Diehl	159 (1989) 199, 318
Suter, D., see T.P. Jarvie	158 (1989) 325
Suter, H.U. and J.R. Huber, S <sub>1</sub> potential energy surface of HONO: absorption spectrum and photodissociation	155 (1989) 203
Suvernev, A.A. and S.I. Temkin, Spin-rotational NMR relaxation of spherical molecules in the gas phase	154 (1989) 49
Suwaiyan, A. and U.K.A. Klein, Picosecond study of solute-solvent interaction of the excited state of indole	159 (1989) 244
Süzer, S., see J. Hacaloglu	153 (1988) 268
Suzuki, H., see T. Shimada	158 (1989) 435
Suzuki, Y., see M. Ata	157 (1989) 19
Svensson, S., see V. Carravetta	152 (1988) 190
Švorčík, V., V. Rybka and V. Myslík, Photoetching of n-GaAs in Na <sup>+</sup> and K <sup>+</sup> salts	157 (1989) 390
Swanton, D.J., R. Ahlrichs and M. Häser, Ab initio SCF calculations of the boron cage molecules B <sub>9</sub> H <sub>9</sub> and B <sub>9</sub> Cl <sub>9</sub>	155 (1989) 329
Syage, J.A., On the direct vibrational spectroscopy of transition states	158 (1989) 122
Syassen, K., see A. Brillante	151 (1988) 243
Symons, M.C.R., R. Janes and A.D. Stevens, Radicals with one-electron silver-carbon bonds formed by ionizing radiation: an ESR study	160 (1989) 386
Sytsma, J., see G. Blasse	155 (1989) 64
Szczepaniak, K., M. Szczesniak and W.B. Person, Infrared studies and the effect of ultraviolet irradiation on the tautomers of 9-methylguanine isolated in an argon matrix	153 (1988) 39
Szczesniak, M., see K. Szczepaniak	153 (1988) 39
Szeluga, Z., see A. Maciejewski	153 (1988) 227
Sztucki, J., see W. Stręk	158 (1989) 301



- Tachibana, A., S. Ishikawa, T. Inoue and T. Yamabe, Extended orbital vibronic constant and attractive force for superconductivity in a molecular model of polyacetylene 154 (1989) 403
- Tachibana, A., H. Fueno, S. Ishikawa and T. Yamabe, A vibronic model of Cooper pairing in a two-dimensional sheet of Cu-O squares in high- $T_c$  copper oxide superconductors 160 (1989) 353
- Tachiya, M. and A. Hummel, Effect of an external electric field on the escape probability in groups of multiple ion pairs in irradiated nonpolar liquids 154 (1989) 497
- Tachiya, M., Effect of the dielectric saturation on the rates of electron transfer in polar solvents 159 (1989) 505
- Tacke, M., see R. Ahlrichs 154 (1989) 104
- Tahara, T., H. Hamaguchi and M. Tasumi, UV-excited transient Raman spectra and the CO stretching frequencies of the lowest excited triplet state of benzophenone 152 (1988) 135
- Tajiri, A., see H. Konami 160 (1989) 163
- Takahara, Y., K. Yamaguchi and T. Fueno, Potential energy curves of fluorine, nitrogen and ethylene calculated by approximately projected unrestricted Hartree-Fock and Møller-Plesset perturbation methods 157 (1989) 211
- Takahara, Y., K. Yamaguchi and T. Fueno, Potential energy curves for transition metal dimers and complexes calculated by the approximately projected unrestricted Hartree-Fock and Møller-Plesset perturbation (APUMP) methods 158 (1989) 95
- Takahashi, K., K. Obi, I. Tanaka and T. Tani, Picosecond kinetics of spectral sensitization by a J-aggregated dye on AgBr microcrystals 154 (1989) 223
- Takahashi, M., see K. Ajito 158 (1989) 193
- Takai, Y., M.M. Donovan, K.H. Johnson and G. Kalonji, Optimization of atomic sphere radii in the scattered-wave X $\alpha$  method: a second look at the water molecule 159 (1989) 376
- Takami, M., see Y. Ohshima 152 (1988) 116, 294
- Takano, S., S. Yamamoto and S. Saito, Millimeter wave spectra of MgS and CaS 159 (1989) 563
- Takasu, Y., K. Yasuda, Y. Matsuda and I. Toyoshima, Adsorption of CO on gold and gold-modified platinum 152 (1988) 105
- Takayanagi, T., see K. Nakamura 160 (1989) 295
- Takegoshi, K., see T.P. Jarvie 158 (1989) 325
- Takematsu, A., H. Seki, S. Arai and M. Hoshino, Low-temperature photolysis of 11,11',12,12'-tetracyano-9,10-dihydro-9,10-ethanoanthracene in 2-methyltetrahydrofuran at 77 K. Photochemistry of the charge-transfer complex between anthracene and tetracyanoethylene 159 (1989) 282
- Takeo, H., see K. Sugawara 157 (1989) 309
- Takeo, H., see T. Nakanaga 160 (1989) 129
- Takeshita, K. and P.K. Mukherjee, Theoretical study on the first broad band of the photoelectron spectrum of H<sub>2</sub>O<sub>2</sub> with inclusion of the vibrational structure 160 (1989) 193
- Talbi, D. and R.P. Saxon, Low-lying states of Li<sub>3</sub>H: Is there an ion-pair minimum? 157 (1989) 419
- Tam, W., B. Guerin, J.C. Calabrese and S.H. Stevenson, 3-methyl-4-methoxy-4'-nitrostilbene (MMONS): crystal structure of a highly efficient material for second-harmonic generation 154 (1989) 93
- Tamai, N., see A. Grabowska 153 (1988) 389
- Tamai, N., see T. Arai 158 (1989) 429
- Tanaka, F., see S. Hirayama 153 (1988) 112
- Tanaka, I., see K. Takahashi 154 (1989) 223
- Tanaka, I., see T. Ishiwata 159 (1989) 594
- Tanaka, K., see Y. Mochizuki 152 (1988) 457
- Tanaka, K., M. Fujitake and E. Hirota, Submillimeter wave spectrum of the vibrationally induced rotational transitions of allene in the degenerate vibrational states 153 (1988) 237

- Tanaka, K., see Y. Akiyama 155 (1989) 15
- Tanaka, T., see Y. Akiyama 155 (1989) 15
- Tang, C.L., see I. Walmsley 154 (1989) 315
- Tang, K.T. and J.P. Toennies, A model for the potential energy surface of H-H<sub>2</sub> in the intermediate- and long-range region 151 (1988) 301
- Tang, Y., see C. Wan 152 (1988) 100
- Tanger IV, J.C., see K.S. Pitzer 156 (1989) 418
- Tani, T., see K. Takahashi 154 (1989) 223
- Tanigaki, K., M. Yagi and J. Higuchi, A new ground-state triplet species formed from 2-nitrobiphenyl by ultraviolet light irradiation 153 (1988) 57
- Tanner, P.A. and N. Edelstein, Infrared luminescence spectrum and crystal-field analysis of neodymium-doped yttrium vanadate 152 (1988) 140
- Tanner, P.A., Vibronic analysis of the (<sup>4</sup>G<sub>5/2</sub>)Γ<sub>8</sub> → <sup>6</sup>H<sub>5/2</sub>, <sup>6</sup>H<sub>7/2</sub>, <sup>6</sup>H<sub>9/2</sub> luminescence transitions of Cs<sub>2</sub>NaYCl<sub>6</sub>:SmCles3-<sub>6</sub> 155 (1989) 59
- Tanuma, H., S. Kita, I. Kusunoki and Y. Sato, Observation of site-specific electronic excitation in Li<sup>+</sup>-CO collisions near threshold 159 (1989) 442
- Tao, Y., Theoretical studies of 1,2-intramolecular hydrogen shifts for HSC<sup>+</sup>/HCS<sup>+</sup>, HSiO<sup>+</sup>/HOSi<sup>+</sup> and HSi<sup>+</sup>/HSSi<sup>+</sup> systems 154 (1989) 374
- Tarr, A.W. and F. Zerbetto, Absolute intensities of CH-stretching overtones in chloroform and deuteriochloroform 154 (1989) 273
- Tasumi, M., see T. Tahara 152 (1988) 135
- Tatewaki, H., see Y. Mochizuki 152 (1988) 457
- Taylor, C.D., see R.J. Glinski 155 (1989) 511
- Taylor, K.J., C.L. Pettiette, M.J. Craycraft, O. Chesnovsky and R.E. Smalley, UPS of negative aluminum clusters 152 (1988) 347
- Taylor, P.R., see C.W. Bauschlicher Jr. 158 (1989) 245
- Tazuke, S., see S. Imabayashi 153 (1988) 23
- Teghil, R., see V. Di Napoli 154 (1989) 217
- Teh, C.K., J. Sipior, M. Fink and M. Sulkes, Spectroscopy of jet-cooled phenylsilanes: the influence of hyperconjugation 158 (1989) 351
- Teitelbaum, H., A generalized rate law for the thermal dissociation of diatomic molecules under non-equilibrium conditions 154 (1989) 90
- Teixeira-Dias, J.J.C., see J.M. Hollas 157 (1989) 31
- Tellinghuisen, J., see C.S. Ewig 153 (1988) 160
- Temkin, S.I., see A.A. Suvernev 154 (1989) 49
- Temps, F., see A. Geers 155 (1989) 614
- Terazima, M. and T. Azumi, The quantum yield of triplet formation and triplet lifetime of pyridine in the liquid phase by the two-photon-excited time-resolved thermal lens method 153 (1988) 27
- Terazima, M., O. Ito and T. Azumi, Picosecond laser spectroscopy of poly(methylphenylsilylene). Confirmation of previous assignment of the broad band 160 (1989) 319
- Terlouw, J.K., see R. Postma 156 (1989) 245
- Terlouw, J.K., see C.E.C.A. Hop 156 (1989) 251
- Thakkar, A.J., see G. Maroulis 156 (1989) 87
- Theodorakopoulos, G., see I.D. Petsalakis 158 (1989) 229; 160 (1989) 189
- Thiel, W., see J. Breidung 153 (1988) 76

Thiel, W., see W. Schneider	157 (1989) 367
Thilagam, A., see H. Schnörer	160 (1989) 80
Thoman Jr., J.W., see D.W. Chandler	156 (1989) 151
Thompson, D.L., see T. Uzer	152 (1988) 405
Thompson, D.L., see B.G. Sumpter	153 (1988) 243
Thompson, J.W. and M.S. Child, Spectroscopic predictions for alkali-atom-alkali-halide reaction intermediates	157 (1989) 343
Thrush, B.A., see N.A. Martin	153 (1988) 200
Thulstrup, E.W., see J.L. Armony	158 (1989) 107
Ticktin, A. and J.R. Huber, Fourier transform Doppler spectroscopy of the photodissociation of polyatomic molecules: energy pair correlations and velocity distributions	156 (1989) 372
Tiemann, E., see J. Kieckhäfer	160 (1989) 570
Tinti, D.S., J.S. Baskin and A.H. Zewail, Picosecond studies of jet-cooled chromyl chloride	155 (1989) 243
Titov, A.A., see S.G. Cheskis	155 (1989) 37
Tobias, D.J., C.L. Brooks III and S.H. Fleischman, Conformational flexibility in free energy simulations	156 (1989) 256
Tockstein, A., Simple kinetic models with bistability applicable to a continuously stirred tank reactor system	152 (1988) 464
Toennies, J.P., see K.T. Tang	151 (1988) 301
Tokue, I., A. Hiraya and K. Shobatake, Photoabsorption spectra and photodissociation of S <sub>2</sub> Cl <sub>2</sub> in the vacuum ultraviolet	153 (1988) 346
Tokumaru, K., see T. Arai	157 (1989) 46; 158 (1989) 429
Tomkinson, J., see D. Noréus	154 (1989) 439
Topp, M.R., see S.A. Wittmeyer	151 (1988) 384; 154 (1989) 1
Topp, M.R., see A.J. Kaziska	154 (1989) 199
Topp, M.R., see C.-J. Ho	158 (1989) 51
Torda, A.E., R.M. Scheek and W.F. van Gunsteren, Time-dependent distance restraints in molecular dynamics simulations	157 (1989) 289
Toriyama, K., see M. Okazaki	160 (1989) 21
Torri, G., see B. Focher	158 (1989) 491
Törring, T., K. Zimmermann and J. Hoefft, The microwave rotational spectrum of X <sup>2</sup> Σ LaO	151 (1988) 520
Toselli, B.M. and J.R. Barker, Ro-vibrational state densities based on spectroscopic data for non-separable systems	159 (1989) 499
Townsend, A., see G.P. Matthews	155 (1989) 518
Toyama, M., see S. Matsumoto	157 (1989) 142
Toyoda, Y., see K. Yamaguchi	159 (1989) 459
Toyoshima, I., see Y. Takasu	152 (1988) 105
Tran, C.D., see M. Franko	158 (1989) 31
Tran-Thi, T.-H., S. Palacin and B. Clergeot, Photogeneration of transient charge carriers in an alternate porphyrin-phthalocyanine Langmuir-Blodgett film	157 (1989) 92
Treacy, J., see O.J. Nielsen	156 (1989) 312
Trenary, M., see S.B. Mohsin	154 (1989) 511
Trifunac, A.D., see D.M. Bartels	152 (1988) 109
Trifunac, A.D., see D.W. Werst	153 (1988) 45
Tripathi, G.N.R., Q. Sun and R.H. Schuler, Resonance enhancement of the non-totally symmetric vibrations in the Raman spectra of para-benzosemiquinone radical anion	156 (1989) 51
Trissl, H.-W., W. Gärtner and W. Leibl, Reversed picosecond charge displacement from the photoproduct K of bacteriorhodopsin demonstrated photoelectrically	158 (1989) 515

Tro, N.J., D.R. Haynes, A.M. Nishimura and S.M. George, Coverage-dependent electronic absorption spectrum of pyrene on $\text{Al}_2\text{O}_3(11\bar{2}0)$	159 (1989) 599
Trokiner, A., see P.P. Man	151 (1988) 143
Trommsdorff, H.P., J.M. Zeigler and R.M. Hochstrasser, Narrow band laser-induced photochemical processes in polysilane solid films at 1.4 K	154 (1989) 463
Trotta, E., see M. Giomini	158 (1989) 334
Troxler, T., R. Knochenmuss and S. Leutwyler, Isomer-specific spectra and ionization potentials of van der Waals clusters	159 (1989) 554
Trucks, G.W., J.D. Watts, E.A. Salter and R.J. Bartlett, Analytical MBPT(4) gradients	153 (1988) 490
Trucks, G.W., see J.D. Watts	157 (1989) 359
Trucks, G.W., see K. Raghavachari	157 (1989) 479; 158 (1989) 207
Trucks, G.W., see C. Sosa	159 (1989) 148
Truhlar, D.G., see M. Zhao	156 (1989) 281
Truhlar, D.G., see S.C. Tucker	157 (1989) 164
Truhlar, D.G., see C. Yu	157 (1989) 491
Trushin, S.A., see A.S. Solodukhin	158 (1989) 70
Tsai, K.H., see H.C. Dorn	155 (1989) 227
Tseng, J.C.-C., S. Huang and L.A. Singer, Structural and spectroscopic studies on 1-(p-N,N-diethylanilino)naphthalene: a compound with an intramolecular charge transfer state	153 (1988) 401
Tsuchida, A., see M. Yamamoto	154 (1989) 559
Tsuchiya, S., see K. Yamanouchi	156 (1989) 301
Tsuchizawa, T., see K. Yamanouchi	156 (1989) 301
Tsuji, M., K. Kobara, S. Yamaguchi, H. Obase, K. Yamaguchi and Y. Nishimura, Dissociative excitation of $\text{SiH}_4$ by collisions with metastable argon atoms	155 (1989) 481
Tsuji, M., K. Kobara, S. Yamaguchi and Y. Nishimura, Dissociative excitation of $\text{SiH}_4$ by collisions with helium active species	158 (1989) 470
Tsujii, Y., see M. Yamamoto	154 (1989) 559
Tsukakoshi, M., see K. Tsukiyama	152 (1988) 523
Tsukiyama, K., Y. Kurematsu, M. Tsukakoshi, A. Misu and T. Kasuya, VUV and UV fluorescence lifetimes of $\text{Cl}_2$	152 (1988) 523
Tsvetkov, Yu.D., see A.V. Astashkin	152 (1988) 258
Tsvetkov, Yu.D., see V.V. Kononov	157 (1989) 257
Tucker, S.C. and D.G. Truhlar, Generalized Born fragment charge model for solvation effects as a function of reaction coordinate	157 (1989) 164
Tuckett, R.P., see S.M. Mason	160 (1989) 575
Tuffin, F., see A. Le Nadan	156 (1989) 24
Tully, F.P., see W.P. Hess	152 (1988) 183
Tully, F.P., see J.L. Durant Jr.	154 (1989) 568
Tüshaus, M., see D. Hoge	151 (1988) 230
Tyryshkin, A.M., see S.A. Dikanov	154 (1989) 34

- Uchide, T., see S. Matsumoto 157 (1989) 142
- Ueda, K., E. Shigemasa, Y. Sato, S. Nagaoka, I. Koyano, A. Yagishita, T. Nagata and T. Hayaishi, Ionic fragmentation following the 3d core excitation of  $\text{Sn}(\text{CH}_3)_4$  by soft X-rays 154 (1989) 357
- Ueda, K., see S. Nagaoka 154 (1989) 363
- Uehara, H., K. Horiai, K. Sueoka and K. Nakagawa, Infrared Fourier transform emission spectrum of GeS 160 (1989) 149
- Uemiya, T., see T. Nogami 155 (1989) 338
- Uemura, T. and T. Ishii, The electric potential in a membrane doped with glycerol trioleate 151 (1988) 217
- Ueno, R., see S. Matsumoto 157 (1989) 142
- Ullas, G., see K. Narayanan 156 (1989) 55
- Ullo, J., see J. Anderson 152 (1988) 447
- Ulrich, J., R. Speer, J. Greis, J.U. von Schütz, H.C. Wolf and R.J. Cogdell, Carotenoid triplet states in pigment-protein complexes from photosynthetic bacteria: absorption-detected magnetic resonance from 4 to 225 K 155 (1989) 363
- Ulrich, K., H. Port and P. Bäuerle, Photochromic thiophenfulgide absorption spectra and kinetics of photochemical isomerizations 155 (1989) 437
- Ulstrup, J., see A.M. Kjær 157 (1989) 447
- Umanskii, S.Ya., see M.A. Ioffe 154 (1989) 131
- Umansky, S.Ya., see A.A. Ioffe 156 (1989) 425
- Umegaki, S., see T. Nogami 155 (1989) 338
- Unemoto, H., J. Kikuma and S. Sato, Electronic energy transfer collisions between  $\text{Cd}(5^3\text{P}_{0,1})$  and ground-state  $\text{CdH}$  ( $\text{CdD}$ ) 153 (1988) 233
- Upham, J.E., see C.A. Woodward 158 (1989) 417
- Urban, M., G.H.F. Dierksen, I. Černušák and Z. Havlas, MBPT and coupled-cluster activation barriers. The model  $\text{S}_\text{N}2$  reaction:  $\text{H}^- + \text{CH}_3\text{F} \rightleftharpoons \text{CH}_4 + \text{F}^-$  159 (1989) 155
- Urban, R.-D., U. Magg and H. Jones, The infrared spectrum of two isotopic species of gallium hydride ( $^{69}\text{GaH}$  and  $^{71}\text{GaH}$ ) 154 (1989) 135
- Urban, R.-D., see A.H. Bahnmaier 155 (1989) 269
- Urban, R.-D., A.H. Bahnmaier, U. Magg and H. Jones, The diode laser spectrum of thallium hydride ( $^{205}\text{TlH}$  and  $^{203}\text{TlH}$ ) in its ground electronic state 158 (1989) 443
- Urdahl, R.S., Y. Bao and W.M. Jackson, Observation of the LIF spectra of  $\text{C}_2(a^3\Pi_u)$  and  $\text{C}_2(A^1\Pi_u)$  from the photolysis of  $\text{C}_2\text{H}_2$  at 193 nm 152 (1988) 485
- Urošević, V., B. Panić, B. Jovanić, Lj. Zeković and P. Savić, Effect of pressure on the rubv fluorescence lifetime 155 (1989) 325
- Urosevic, V.V., see B.R. Jovanic 158 (1989) 172
- Urry, D.W., see F. Sciortino 153 (1988) 557
- Uzer, T., B.D. MacDonald, Y. Guan and D.L. Thompson, Theoretical studies of mode specificity in the dissociation of overtone-excited hydrogen peroxide 152 (1988) 405

- Vaida, V., see E.C. Richard 157 (1989) 295
- Valdemoro, C., M. Reguero and L. Lain, A new partitioning of the total energy and its application to an analysis of a non-variational approach to many-electron theory, *Chem. Phys. Letters* 147 (1988) 219. Erratum 152 (1988) 118
- Valentini, J.J., see G.J. Germann 157 (1989) 51
- Valtazanos, P., see C.A. Nicolaides 151 (1988) 22
- Valtazanos, P., E.D. Simandiras and C.A. Nicolaides, Structure and vibrational analysis of protonated hydrogen peroxide 156 (1989) 240
- Van den Berg, T.H.M. and A. van der Avoird, Analytical two- and three-dimensional lattice sums for general multipole interactions 160 (1989) 223
- Van der Auweraer, M., see A. Malliaris 155 (1989) 587
- Van der Avoird, A., see T.H.M. van den Berg 160 (1989) 223
- Van der Does, T., see O. Grabandt 155 (1989) 221
- Van der Maarel, J.R.C., Relaxation of spin 3/2 in a nonzero average electric field gradient 155 (1989) 288
- Van der Plas, H.C., see U. Hofstra 151 (1988) 169
- Van der Pol, J.F., see G. Blasse 154 (1989) 420
- Van de Weijer, P., B.H. Zwerver and J.L.G. Suijker, Chemiluminescence during thermal chemical vapour deposition of SiO<sub>2</sub> from silane-oxygen mixtures 153 (1988) 33
- Van Dijk, M., see U. Hofstra 151 (1988) 169
- Van Gursteren, W.F., see A.E. Torda 157 (1989) 289
- Van Leeuwen, P.A., see E. van Oort 154 (1989) 587
- Van Lenthe, J.H., see R. Postma 156 (1989) 245
- Van Oort, E., P.A. van Leeuwen and M. Glasbeek, Phase control of spin coherence in electronic triplet states by two-frequency microwave excitation 154 (1989) 587
- Van Schaik, W., see H. Donker 158 (1989) 509
- Van Slooten, U., see T.C.M. Horn 156 (1989) 623
- Van Velzen, P.N.T., see A.H.M. Sondag 155 (1989) 503
- Van Zee, R.D., S.C. Blankespoor and T.S. Zwier, Spectroscopic studies of the Hg-He and Hg-Ar<sub>2</sub> van der Waals' complexes: the Hg vapor fluorescence filter 158 (1989) 306
- Vasudev, R., see J.H. Shan 158 (1989) 317; 160 (1989) 614
- Vecchio, G., see B. Focher 158 (1989) 491
- Vecchiocattivi, F., see V. Aquilanti 156 (1989) 109
- Vega, S., see A. Schmidt 157 (1989) 539
- Velasco, S., see A. Calvo Hernández 160 (1989) 60
- Vergès, J., J. Chevillard, C. Alamichel and J.-R. Etcheberry, Study of overtones and combination bands in the infrared spectrum of ONCl 159 (1989) 315
- Vericat, F., see J.R. Grigera 156 (1989) 615
- Verlaque, P., see P. Roubin 160 (1989) 345
- Verma, A.L., K. Kimura, T. Yagi, A. Nakamura, H. Inokuchi and T. Kitagawa, SERR evidence for enzymatic reduction of cytochrome c<sub>3</sub> adsorbed on Ag colloids 159 (1989) 189
- Vetter, R., see F.X. Gadéa 151 (1988) 183
- Veyret, B., see G.K. Moortgat 160 (1989) 443
- Veža, D., see D. Fijan 154 (1989) 126
- Viers, J.W., see F.A. Senese 160 (1989) 423
- Vigoureux, J.M., see F. Depasse 160 (1989) 311
- Vij, J.K. and F. Hufnagel, Millimeter and submillimeter laser spectroscopy of water 155 (1989) 153
- Vilaseca, E., see P. Alemany 156 (1989) 525



Vilaseca, E. and F. Illas, Monte Carlo study of the vibrational frequency of halogen atoms chemisorbed on Ag(100): frequency versus coverage relationships	159 (1989) 165
Villamañán, R.M. and J.L. Alonso, Microwave spectrum and rotational isomerism of 3-fluorostyrene	159 (1989) 97
Virlet, J., see A. Llor	152 (1988) 248
Virtanen, J., see M. Yliperttula	152 (1988) 61
Visser, A.J.W.G., see B.D. Schlyer	154 (1989) 39
Visticot, J.P., see C. Alcaraz	156 (1989) 191
Vogel, E., see K.M.T. Yamada	160 (1989) 113
Vogel, W., D.-G. Welsch and B. Wilhelmi, Time-resolved spectral hole burning	153 (1988) 376
Vogel, W., see H. Kühn	158 (1989) 233
Vogler, A. and H. Kunkely, Photoluminescence of tetrameric silver(I) complexes	158 (1989) 74
Vojtků, J., I. Paidarová, V. Špirko, J. Šavrdá and M. Petráš, Ab initio calculation of deuterium quadrupole coupling constants for low-lying rovibrational levels of HD in its $X^1\Sigma_g^+$ and $B^1\Sigma_u^+$ states	157 (1989) 337
Völcker, A., H.-J. Adick, R. Schmidt and H.-D. Brauer, Near-infrared phosphorescence emission of compounds with low-lying triplet states	159 (1989) 103
Von Maltzan, B., see S.P. Greiner	155 (1989) 93
Von Schütz, J.U., see A. Angerhofer	151 (1988) 195
Von Schütz, J.U., see J. Ullrich	155 (1989) 363
Vračko, M., C.-M. Liegener and J. Ladik, Quasi-particle bands of a graphite monolayer	153 (1988) 166
Vreeker, R., E.J. Lous and A.J. Hoff, Absorbance-detected electron spin echoes from bacterial photosynthetic reaction centers. A theoretical study	158 (1989) 24
Vujkovic Cvijin, P., J.J. O'Brien, G.H. Atkinson, W.K. Wells, J.I. Lunine and D.M. Hunten, Methane overtone absorption by intracavity laser spectroscopy	159 (1989) 331
Vulpis, T., see R. Houriet	154 (1989) 454

- Wada, A., see N. Ami 153 (1988) 118
- Wahl, M., see B. Atakan 154 (1989) 449; 155 (1989) 609
- Wahl, M., see A. Jacobs 158 (1989) 161
- Wahner, A., A.R. Ravishankara, S.P. Sander and R.R. Friedl, Absorption cross section of BrO between 312 and 385 nm at 298 and 223 K 152 (1988) 507
- Walder, G., C. Winkler and T.D. Märk, Transfer of vibrational energy in nitrogen clusters doped with O<sub>2</sub>: new evidence for the origin of quantum effects in the metastable decay series of (N<sub>2</sub>)<sub>n</sub><sup>++</sup> 157 (1989) 224
- Walker, G.C., see S.R. Flom 154 (1989) 193
- Walker, R.B., see E.F. Hayes 151 (1988) 537
- Wallace, I., R.R. Bennett and W.H. Breckenridge, Spectroscopic characterization of the X<sup>1</sup>Σ<sub>0</sub><sup>+</sup> and C<sup>1</sup>Π<sub>i</sub> states of the ZnAr van der Waals molecule 153 (1988) 127
- Wallace, R., The torsional energy levels of ethylene: a re-evaluation 159 (1989) 35
- Waller, I.M., see T.N. Kitsopoulos 159 (1989) 300
- Walmsley, I., F.W. Wise and C.L. Tang, On the difference between quantum beats in impulsive stimulated Raman scattering and resonance Raman scattering 154 (1989) 315
- Walsh, A.M. and R.F. Loring, Theory of resonant and nonresonant impulsive stimulated Raman scattering 160 (1989) 299
- Walter, C.W., B.G. Lindsay, K.A. Smith and F.B. Dunning, Translational energy release in dissociative electron attachment to CH<sub>3</sub>I, CD<sub>3</sub>I, CF<sub>3</sub>I and CF<sub>3</sub>Br 154 (1989) 409
- Walter, K., R. Weinkauff, U. Boesl and E.W. Schlag, Spectroscopy of the benzene cation: resonance-enhanced multiphoton dissociation spectra of the  $\tilde{B}(E_{2g}) \leftarrow \tilde{X}(E_{1g})$  transition 155 (1989) 8
- Walther, H., see A. Doddy 151 (1988) 133
- Walther, H., see H. Kuze 153 (1988) 569
- Wan, C., K. Sun, G. Xu and Y. Tang, Surface-enhanced Raman scattering from heated para-substituted benzoic acid-silver sol solutions 152 (1988) 100
- Wan, J.K.S., see F.J. Adrian 155 (1989) 333
- Wang, D.P., L.C. Lee and S.K. Srivastava, Electron-impact ionization of CH<sub>3</sub> in 10-22 eV 152 (1988) 513
- Wang, H.-Q., see L.S. Prasad 151 (1988) 443
- Wang, J.H., see J.M. Parson 152 (1988) 330
- Wang, J.Z., see K. Balasubramanian 154 (1989) 525
- Wang, K. and S.-I. Chu, Fractal character of quasi-energy states in intense polychromatic fields 153 (1988) 87
- Wang, L., B. Niu, Y.T. Lee and D.A. Shirley, Vibrational spectra of Se<sub>2</sub><sup>+</sup> and T<sub>2</sub><sup>+</sup> in their ground states 158 (1989) 297
- Wang, P.-N., E.C. Lim and W. Siebrand, Observation and analysis of quantum beats in the P(2) rotational band of the S<sub>1</sub>←S<sub>0</sub> (0-0) excitation spectrum of pyrazine 159 (1989) 7
- Wang, X., see P. Zhang 153 (1988) 215
- Wang, X., X. Liu, T. Song, J. Hu and J. Qiu, Substitution of Si in SAPO-5 157 (1989) 87
- Wang, Y., see P. Zhang 153 (1988) 215
- Ward, R.C., see R.C.T. Slade 155 (1989) 305
- Ware, W.R., see A. Siemiarczuk 160 (1989) 285
- Warman, J.M., see K.J. Smit 152 (1988) 177
- Washida, N., see H. Shinohara 153 (1988) 417
- Washida, N., see A. Miyoshi 160 (1989) 291
- Wasielewski, M.R., see U. Hofstra 151 (1988) 169
- Wasser, H.R., see P. Diehl 159 (1989) 199, 318

- Wategaonkar, S.J., see J.H. Shan 158 (1989) 317; 160 (1989) 614
- Wattel, G., see P. Pradel 158 (1989) 412
- Watson, L.T., see F.A. Senese 160 (1989) 423
- Watt, B.H., see M.P. Banjavcic 160 (1989) 371
- Watts, J.D., see G.W. Trucks 153 (1988) 490
- Watts, J.D., see A.W. Allaf 155 (1989) 32
- Watts, J.D., G.W. Trucks and R.J. Bartlett, The unitary coupled-cluster approach and molecular properties. Applications of the UCC(4) method 157 (1989) 359
- Watts, R.O., see G.W. Bryant 151 (1988) 309
- Weare, J.H., see I.L. Garzón 158 (1989) 525
- Webber, S.E., see E.S. Smotkin 152 (1988) 265
- Wei, T.-G., see B. Ramachandran 151 (1988) 540
- Weijnitz, P., see L.-E. Berg 159 (1989) 175
- Weiner, B.R., see L. Pasternack 154 (1989) 121
- Weingärtner, H., see M.A. Suhm 159 (1989) 193
- Weinkauff, R., see K. Walter 155 (1989) 8
- Weisman, R.B., see J.E. Stout 151 (1988) 156
- Weisman, R.B., see J.T. Miller 158 (1989) 179
- Weller, A., see H. Staerk 155 (1989) 603
- Weller, R., see B. Atakan 154 (1989) 449; 155 (1989) 609
- Weller, R., see A. Jacobs 158 (1989) 161
- Wells, W.K., see P. Vujkovic Cvijin 159 (1989) 331
- Welsch, D.-G., see W. Vogel 153 (1988) 376
- Welsch, D.-G., see H. Kühn 158 (1989) 233
- Werst, D.W., L.T. Percy and A.D. Trifunac, Solid state FDMR studies of ion-molecule reactions in radiolysis of saturated hydrocarbons 153 (1988) 45
- West, B.C., see R.C.T. Slade 155 (1989) 305
- Westbrook, J.D., see J.T. Blair 154 (1989) 531
- Western, C.M., see R.N. Dixon 151 (1988) 328
- Westlund, P.-O. and R.M. Lynden-Bell, Separation of vibrational dephasing and reorientational contributions to the infrared and Raman lineshapes in a simulation of MeCN 154 (1989) 67
- Westre, S.G., see P.B. Kelly 151 (1988) 253
- Whetten, R.L., see D.C. Easter 157 (1989) 277
- White, J.A., see A. Calvo Hernández 160 (1989) 60
- White, J.M., see E.S. Smotkin 152 (1988) 265
- Whyte, A.R., K.F. Lim, R.G. Gilbert and W.L. Hase, The calculation and interpretation of average collisional energy transfer parameters 152 (1988) 377
- Wiebrecht, J.W., see A. Geers 155 (1989) 614
- Wieczorek, D., see P. Myslinski 155 (1989) 256
- Wiesen, P., see K.H. Becker 154 (1989) 342
- Wiesen, P., see W. Bauer 158 (1989) 321
- Wiesner, J. and A. Wokaun, Anisometric gold colloids. Preparation, characterization, and optical properties 157 (1989) 569
- Wight, C.A., see S. Niles 154 (1989) 458
- Wilhelmi, B., see W. Vogel 153 (1988) 376
- Williams, G., see N. Boden 152 (1988) 94; 154 (1989) 613
- Williams, M.L., see J.G. Powles 156 (1989) 543

- Wilson, K.R. and R.D. Levine, Activated chemical reactions driven by accepted fluctuations 152 (1988) 435
- Wilson, R.S. and B.J. Chu-Ko, Study of harmonic crystal momentum autocorrelation and fluctuation functions 151 (1988) 431
- Winkler, C., see G. Walder 157 (1989) 224
- Winnewisser, B.P., see F. Stroh 160 (1989) 105
- Winnewisser, G., see E. Herbst 155 (1989) 572
- Winnewisser, G., see K.M.T. Yamada 160 (1989) 113
- Winnewisser, M., see F. Stroh 155 (1989) 21; 160 (1989) 105
- Winscom, C.J., see S.P. Greiner 155 (1989) 93
- Winstead, C.L. and P.W. Langhoff, Hilbert-space formulation of Feshbach-Fano methods for atomic and molecular photoionization: optimal choice of zeroth-order states in shape-resonance channels 151 (1988) 417
- Winzenburg, J., see S.P. Greiner 155 (1989) 93
- Wise, F.W., see I. Walmsley 154 (1989) 315
- Wisløff Nilssen, E., see I. Røeggen 157 (1989) 409
- Wittig, C., see S.W. Sharpe 151 (1988) 267
- Wittig, C., Y.M. Engel and R.D. Levine, Analyses of photoinitiated H+CO<sub>2</sub> reactions: gas phase single-collision conditions and CO<sub>2</sub>HBr adducts 153 (1988) 411
- Wittig, C., see G. Hoffmann 155 (1989) 356
- Wittig, C., see Y. Chen 159 (1989) 426
- Wittl, F., see M. Creuzburg 156 (1989) 387
- Wittmeyer, S.A., A.J. Kaziska, M.I. Shchuka, A.L. Motyka and M.R. Topp, Picosecond time resolution of the S<sub>2</sub> fluorescence of jet-cooled xanthione 151 (1988) 384
- Wittmeyer, S.A., A.J. Kaziska, A.L. Motyka and M.R. Topp, Time-resolved desorption of argon and methane from the surface of a perylene molecule 154 (1989) 1
- Wittmeyer, S.A., see A.J. Kaziska 154 (1989) 199
- Wlodarczak, G., see J. Gadhi 156 (1989) 401
- Wofford, B.A., see K. McMillan 152 (1988) 87
- Wofford, B.A., R.S. Ram, A. Quinonez, J.W. Bevan, W.B. Olson and W.J. Lafferty, Rotational analysis of the  $\nu_2^1$  intermolecular hydrogen bond bending vibration in HCN-HF using far infrared Fourier transform spectroscopy 152 (1988) 299
- Wojtczak, J., see A. Maciejewski 153 (1988) 227
- Wokaun, A., see F.-H. Haegel 157 (1989) 328
- Wokaun, A., see J. Wiesner 157 (1989) 569
- Wolf, H.C., see A. Angerhofer 151 (1988) 195
- Wolf, H.C., see J. Ullrich 155 (1989) 363
- Wolfrum, J., see B. Atakan 154 (1989) 449; 155 (1989) 609
- Wolfrum, J., see R. Schwarzwald 158 (1989) 60
- Wolfrum, J., see A. Jacobs 158 (1989) 161
- Wong, C.F., C. Zheng and J.A. McCammon, Glass transition in SPC/E water and in a protein solution: a molecular dynamics simulation study 154 (1989) 151
- Woodward, C.A., J.E. Upham and A.J. Stace, Collision-induced vibrational excitation of Ar<sub>2</sub><sup>+</sup> 158 (1989) 417
- Woodward, J.R., see S.H. Cobb 156 (1989) 197
- Worley, S.D., see W.C. Neely 155 (1989) 381
- Worley, S.D., see D.K. Paul 160 (1989) 559
- Wörmer, J., V. Guzielski, J. Stapelfeldt and T. Möller, Fluorescence excitation spectroscopy of xenon clusters in the VUV 159 (1989) 321

- Wormhoudt, J. and K.E. McCurdy, A measurement of the strength of the  $\nu_2$  band of  $\text{CH}_3$  156 (1989) 47
- Wormhoudt, J., K.E. McCurdy and J.B. Burkholder, Measurements of the strengths of infrared bands of  $\text{CF}_2$  158 (1989) 480
- Wright, D.W., see D.B. Chesnut 151 (1988) 415
- Wright, J.S. and P.J. Bruna, Strongly bound doubly excited states of diatomic molecules 156 (1989) 533
- Wu, K.T., Interfragment effect in the predissociative excitation of linear triatomic molecules 156 (1989) 187
- Wu, W.-X., see J.T. Miller 158 (1989) 179
- Wu, X. and S. Zhang, Selective polarization inversion and depolarization of  $^{13}\text{C}$  in cross relaxation in NMR 156 (1989) 79
- Wu, X., see S. Zhang 156 (1989) 82, 333
- Wu, Y.-Y.J., P.M. Hunt, G.E. Leroi and S.R. Crouch, Dual laser ionization (DLI) measurements of ion mobilities in a  $\text{H}_2\text{-O}_2\text{-Ar}$  flame 155 (1989) 69
- Wu, Z., see P.S. Shaw 151 (1988) 449
- Wu, Z.-C., see S.-I. Chu 157 (1989) 151
- Wülfert, S., see A. Furlan 153 (1988) 291
- Wyatt, R.E., see B. Ramachandran 151 (1988) 540
- Wyatt, R.E., see D.E. Manolopoulos 152 (1988) 23; 159 (1989) 123
- Wyatt, R.E., see J.-P. Brunet 153 (1988) 425

*Master index to volumes 151-160*

Xie, J. and R.N. Zare, Rotationally state-selected $\text{HBr}^+$ : preparation and characterization	159 (1989) 399
Xin, H., see P. Zhang	153 (1988) 215
Xu, G., see C. Wan	152 (1988) 100



Yabushita, S. and K. Morokuma, Potential energy surfaces for rotational excitation of CH <sub>3</sub> product in photodissociation of CH <sub>3</sub> I	153 (1988) 517
Yadav, A., see R.A. Poirier	156 (1989) 122
Yagi, M., see K. Tanigaki	153 (1988) 57
Yagi, M., see Y. Shioya	154 (1989) 25
Yagi, M., H. Shirai, J. Ohta and J. Higuchi, The effects of conformation and coordination to zinc(II) ions on the lowest triplet state of 6,6'-dimethyl-2,2'-bipyridine: a time-resolved ESR study	160 (1989) 13
Yagi, T., see A.L. Verma	159 (1989) 189
Yagishita, A., see K. Ueda	154 (1989) 357
Yagishita, A., see S. Nagaoka	154 (1989) 363
Yamabe, S., see K. Hiraoka	154 (1989) 139
Yamabe, T., see A. Tachibana	154 (1989) 403; 160 (1989) 353
Yamada, I., see L. Dubicki	157 (1989) 315
Yamada, K.M.T., M.W. Markus, G. Winnewisser, W. Joentgen, R. Kock, E. Vogel and H.-J. Altenbach, Isocyanogen as a pyrolysis product of N-cyano-2,3-diphenylcyclopropeneimine	160 (1989) 113
Yamaguchi, K., see M. Tsuji	155 (1989) 481
Yamaguchi, K., see Y. Takahara	157 (1989) 211; 158 (1989) 95
Yamaguchi, K., Y. Toyoda and T. Fueno, Ab initio calculations of effective exchange integrals for triplet carbene clusters. Importance of stacking modes for ferromagnetic interactions	159 (1989) 459
Yamaguchi, K. and T. Fueno, An effective spin Hamiltonian for clusters of organic radicals. Application to allyl radical clusters	159 (1989) 465
Yamaguchi, S., see M. Tsuji	155 (1989) 481; 158 (1989) 470
Yamamoto, M., Y. Tsujii and A. Tsuchida, Near-infrared charge resonance band of intramolecular carbazole dimer radical cations studied by nanosecond laser photolysis	154 (1989) 559
Yamamoto, S., see Y. Mochizuki	152 (1988) 457
Yamamoto, S., see S. Takano	159 (1989) 563
Yamanouchi, K., T. Tsuchizawa, J. Miyawaki and S. Tsuchiya, Experimental evidence for Rydberg and ion-pair state mixing of Cl <sub>2</sub> in the 1 <sup>1</sup> Σ <sub>u</sub> <sup>+</sup> state	156 (1989) 301
Yamauchi, S., H. Kanno and Y. Akama, Far-infrared evidence for the hydration number change of rare earth ions in aqueous solution	151 (1988) 315
Yamauchi, S. and H. Kanno, Observation of resolved Raman bands for solvated ions in glassy alcohol solutions	154 (1989) 248
Yamauchi, S., see M. Koyanagi	154 (1989) 577
Yamauchi, S., see M. Kato	157 (1989) 543
Yamazaki, I., see T. Arai	158 (1989) 429
Yang, W. and A.C. Peet, The collocation method for bound solutions of the Schrödinger equation	153 (1988) 98
Yang, X., see R.N. Dixon	151 (1988) 328
Yang, Y.A., C.W.S. Conover and L.A. Bloomfield, Production and photodetachment of stoichiometric sodium chloride cluster anions	158 (1989) 279
Yashonath, S., P. Demontis and M.L. Klein, A molecular dynamics study of methane in zeolite NaY	153 (1988) 551
Yasuda, K., see Y. Takasu	152 (1988) 105
Yasuda, N., see T. Nogami	155 (1989) 338

- Yasuda, T., see S. Matsumoto 157 (1989) 142
- Yates, B.F. and H.F. Schaefer III, Tetrasilacyclobutadiylidene: the lowest energy cyclic isomer of singlet Si<sub>4</sub>H<sub>4</sub>? 155 (1989) 563
- Yersin, H., see T. Schönherr 158 (1989) 519
- Yin, Y., see R.L. Blakley 157 (1989) 398
- Yinnon, A.T., see G. Petrella 158 (1989) 250
- Yip, S., see J. Anderson 152 (1988) 447
- Yliperttula, M., H. Lemmetyinen, J. Mikkola, J. Virtanen and P.K.J. Kinnunen, Stationary and time-resolved fluorescence anisotropy of pyrene lecithin in LB films 152 (1988) 61
- Yonemura, H., H. Nakamura and T. Matsuo, External magnetic field effects on photoinduced electron transfer reactions in phenothiazine-viologen-linked systems complexed with cyclodextrins 155 (1989) 157
- Yoo, C.S., Y.M. Gupta and P.D. Horn, Pressure-induced resonance Raman effect in shocked carbon disulfide 159 (1989) 178
- Yoshihara, K., see A. Grabowska 153 (1988) 389
- Yoshihara, K., see S.R. Meech 154 (1989) 20
- Yoshihara, K., see N. Shimo 156 (1989) 31
- Yoshikawa, K. and M. Makino, Self-pulsing at an oil/water interface in the presence of phospholipid 160 (1989) 623
- Young, A.T., see G.C. Stutzin 155 (1989) 475
- Youvan, D.C., see C. Kirmaier 159 (1989) 251
- Yu, C., D.J. Kouri, M. Zhao, D.G. Truhlar and D.W. Schwenke, Converged three-dimensional quantum mechanical reaction probabilities and delay times for the F+H<sub>2</sub> reaction on a potential energy surface with a realistic exit valley 157 (1989) 491

- Zaera, F., see J.L. Gland 151 (1988) 227
- Zakaraya, M.G., see A.M. Kjær 157 (1989) 447
- Zanasi, R., see P.J. Stephens 156 (1989) 509
- Zanchini, C., see D. Gatteschi 160 (1989) 157
- Zanni, H., see P.P. Man 151 (1988) 143
- Zare, R.N., see R.S. Blake 153 (1988) 365
- Zare, R.N., see K.-D. Rinnen 153 (1988) 371
- Zare, R.N., Photofragment angular distributions from oriented symmetric-top precursor molecules 156 (1989) 1
- Zare, R.N., see M.J. Bronikowski 156 (1989) 7
- Zare, R.N., see J.-M. Philpott 158 (1989) 12
- Zare, R.N., see J. Xie 159 (1989) 399
- Zarrabian, S. and R.J. Bartlett, Application of high-order multi-reference MBPT to the excitation energies of the Be atom 153 (1988) 133
- Zarrabian, S., C.R. Sarma and J. Paldus, Vectorizable approach to molecular CI problems using determinantal basis 155 (1989) 183
- Zarrabian, S., see R.J. Harrison 158 (1989) 393
- Zax, D.B., see T.P. Jarvie 158 (1989) 325
- Zeegers-Huyskens, Th., Isotopic ratio  $\nu_{\text{HF}}/\nu_{\text{HD}}$  of hydrogen fluoride complexes in solid argon 157 (1989) 105
- Zeigler, J.M., see H.P. Trommsdorff 154 (1989) 463
- Zeković, Lj., see V. Urošević 155 (1989) 325
- Zekovic, Lj.D., see B.R. Jovanic 158 (1989) 172
- Zen, M., see M. Scotoni 155 (1989) 233
- Zenobi, R., see J.-M. Philpott 158 (1989) 12
- Zerbetto, F. and M.Z. Zgierski, On the vibrational force fields of the ground state of trans- and cis-polyacetylenes 151 (1988) 526
- Zerbetto, F. and M.Z. Zgierski, Why do the  $S_0 \rightarrow S_1(n\pi^*)$  and  $S_0 \rightarrow T_2(n\pi^*)$  transitions in acetophenone display different activity of the methyl group torsion? 153 (1988) 436
- Zerbetto, F., see A.W. Tarr 154 (1989) 273
- Zerbetto, F. and M.Z. Zgierski, On the  $1A_g \rightarrow 1B_u$  absorption spectrum of four butadiene isotopomers 157 (1989) 515
- Zerbi, G., see M.N. Ramos 151 (1988) 397; 152 (1988) 528
- Zerbi, G., see M. Gussoni 160 (1989) 200
- Zerega, Y., see G. Brincourt 156 (1989) 573
- Zerner, M.C., see S. Canuto 157 (1989) 353
- Zerner, M.C., see J. Leszczynski 159 (1989) 143
- Zerner, M.C., see M. Kotzian 160 (1989) 168
- Zewail, A.H., see V. Engel 152 (1988) 1
- Zewail, A.H., see D.S. Tinti 155 (1989) 243
- Zewail, A.H., see R.M. Bowman 156 (1989) 131
- Zewail, A.H., see M. Dantus 159 (1989) 406
- Zgierski, M.Z., see F. Zerbetto 151 (1988) 526; 153 (1988) 436; 157 (1989) 515
- Zgierski, M.Z., On the temperature dependence of the  $P(-)$  absorption peak position in the optical spectra of the reaction center of *Rhodospseudomonas viridis* 153 (1988) 195
- Zhang, B., see P. Zhang 153 (1988) 215
- Zhang, C., see Z. Ma 154 (1989) 9
- Zhang, H., see Y. Jiang 159 (1989) 159

- Zhang, J.Z.H. and W.H. Miller, Quantum reactive scattering via the *S*-matrix version of the Kohn variational principle: integral cross section for  $\text{H} + \text{H}_2(v_1=j_1=0) \rightarrow \text{H}_2(v_2=1, j_2=1, 3) + \text{H}$  in the energy range  $E_{\text{total}} = 0.9\text{--}1.4$  eV 153 (1988) 465
- Zhang, J.Z.H. and W.H. Miller, Differential cross section (angular distribution) for the reaction  $\text{H} + \text{H}_2(v=j=0) \rightarrow \text{H}_2(v', \text{odd } j') + \text{H}$  in the energy range  $0.90\text{--}1.35$  eV 159 (1989) 130
- Zhang, J.Z.H., Interaction representation in time-dependent quantum scattering: elimination of finite boundary reflection 160 (1989) 417
- Zhang, P., Y. Wang, T. He, B. Zhang, X. Wang, H. Xin and F. Liu, SERS of pyridine, 1,4-dioxane and 1-ethyl-3'-methyl-2-thiacyanine iodide adsorbed on  $\alpha\text{-Fe}_2\text{O}_3$  colloids 153 (1988) 215
- Zhang, R., see M.J. Bronikowski 156 (1989) 7
- Zhang, S., see X. Wu 156 (1989) 79
- Zhang, S. and X. Wu, Windowless solid echo 156 (1989) 82
- Zhang, S. and X. Wu, A new model for cross polarization in the rotating frame in solids 156 (1989) 333
- Zhang, S. and M. Mehring, A modified Goldman-Shen NMR pulse sequence 160 (1989) 644
- Zhao, G., see M. Bensimon 157 (1989) 97
- Zhao, J., see S. Li 151 (1988) 403
- Zhao, M., D.G. Truhlar, D.J. Kouri, Y. Sun and D.W. Schwenke, Quantum mechanical interference effects on vibrational excitation in the reaction  $\text{D} + \text{H}_2 \rightarrow \text{HD} + \text{H}$ : delay times and dependence of the vibrational enhancement on angular momentum 156 (1989) 281
- Zhao, M., see C. Yu 157 (1989) 491
- Zhao, X.Z., T.X. Lu and Z.F. Cui, Theoretical calculations of the  ${}^2\text{B}_1\text{--}{}^2\text{A}_1$  subband of  $\text{NO}_2$  159 (1989) 37
- Zhao, Y., see J.S. Francisco 153 (1988) 296
- Zheng, C., see C.F. Wong 154 (1989) 151
- Zhidomirov, G.M., see V.G. Malkin 152 (1988) 44
- Zhu, H., see Y. Jiang 159 (1989) 159
- Zhu, S.-B. and G.W. Robinson, Possible breakdown of the reaction coordinate concept in condensed-phase chemistry 153 (1988) 539
- Zhu, X.D., Th. Rasing and Y.R. Shen, Laser-induced thermal desorption of CO on Ni(111): determination of pre-exponential factor and heat of desorption 155 (1989) 459
- Zhuk, Yu.N. and K.S. Klopovsky, Quasiclassical calculations of the rate constants for V-V exchange in nitrogen 153 (1988) 181
- Zimmermann, K., see T. Töring 151 (1988) 520
- Zimmt, M.B., The energy of the twisted excited singlet state of tetraphenylethylene: picosecond optically detected calorimetry 160 (1989) 564
- Zinth, W., see W. Holzapfel 160 (1989) 1
- Zitserman, V.Yu., see A.M. Berezhkovskii 158 (1989) 369
- Zivkovic, T.P., see W.C. Herndon 152 (1988) 233
- Zuckermann, H., B. Schmitz and Y. Haas, The radiative lifetime of acetone: resolution of an apparent discrepancy 151 (1988) 323
- Zueva, G.Ya., see K.N. El'tsov 158 (1989) 271
- Zundel, G., see B. Brzezinski 156 (1989) 213; 157 (1989) 512
- Zwerver, B.H., see P. Van de Weijer 153 (1988) 33
- Zwier, T.S., see R.D. van Zee 158 (1989) 306

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# Handbook on the Physics and Chemistry of Rare Earths, Volume 11

## Two-Hundred-Year Impact of Rare Earths on Science

K.A. Gschneidner, Jr. and L. Eyring (editors)

1988 xiv + 594 pages US \$184.25/Dfl.350.00 Subscr.Price: US \$158.00/Dfl.300.00  
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This volume celebrates the contribution of rare earth research to the development of science since these elements' published discovery two centuries ago.

The prologue is a biographical sketch of F.H. Spedding, who contributed extensively to rare earth science during more than fifty years of published research. The discovery and separation of the rare earths is narrated by Szabadváry, who has succeeded in lighting many dark corners of this confusing history and hence provides many new scenes in this lively yet serious saga. The techniques of atomic spectroscopy were applied immediately upon this development to the identification of the new rare earths, dashing the claims of many and confirming those of others. Judd provides a definitive and perceptive account of the further success in the use of this science during the past sixty years to clarify the electronic configurations of the rare earths. Jørgensen records his own special insights into the idiosyncratic chemical behaviour of these seventeen elements. The scope of this treatment begins with their primordial formation in the stars and includes the chemical basis of their classification and integration into the fabric of science. Magnetism in the lanthanides has been of interest at least since the observation of ferromagnetism in gadolinium by Urbain in 1935. Since that time these materials have been the centre-stage in the development of magnetic theory and advanced applications. Two chapters emphasize the unique role played by these elements in understanding magnetic interactions. The first chapter by Rhyne highlights certain exotic magnetic phenomena in the lanthanide metals and alloys, and the second, by Bleaney, considers the general field of magnetic resonance spectroscopy and hyperfine interactions, including a description of the modern techniques that generate this information. The metallurgy of rare earths is discussed by Gschneidner, Jr. and Daane, two of the most active in this area during its rapid ascension. Finally, Taylor and McLennan show how the progressive change of chemical and physical properties of the series, with the useful discontinuous exceptions, find especial use in revealing the progress of geochemical and geophysical processes in the formation of many of earth's features and analogous ones of the heavenly bodies.

The reader of any chapter of special interest in this volume will find reference to sections of other chapters that give extended coverage of some aspects of the same topic of interest. This underlines the breadth of the impact on science of the discovery, separation and study of the rare earths.

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# Chemistry and Physics of Matrix-Isolated Species

edited by **L. Andrews**, University of Virginia, Charlottesville, VA, USA, and  
**M. Moskovits**, University of Toronto, Toronto, Ontario, Canada

Matrix-isolation spectroscopy, as a technique for studying unstable species, has had tremendous lasting powers. Since 1954, matrix-isolation has been able to assimilate new technology rather than being replaced by it. Conferences celebrating its results have become thriving enterprises.

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# THEORY OF TOKAMAK PLASMAS

by **R.B. White**, *Princeton Plasma Physics Laboratory, Princeton University, NJ, U.S.A.*

**1989 372 pages**

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Theory of Tokamak Plasmas is a graduate textbook on tokamak physics, designed to provide a basic introduction to plasma equilibrium, particle orbits, transport, and those ideal and resistive magnetohydrodynamic instabilities which dominate the behavior of a tokamak discharge, and to develop the mathematical methods necessary for their theoretical analysis.

Primarily the book covers the consequences of ideal and resistive magnetohydrodynamics, these theories being responsible for most of what is well understood regarding the physics of tokamak discharges. The focus is on the description of equilibria, the linear and nonlinear theory of large scale modes, and single particle guiding center motion, including simple neoclassical effects. Modern methods of general magnetic coordinates are used, and the reader is introduced to the onset of chaos in Hamiltonian systems in the discussion of destruction of magnetic surfaces. Much of the book is devoted to the description of the limitations placed on tokamak operating parameters given by ideal and resistive modes, and current ideas about how to extend and optimize these parameters.

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